

RECORD

B & W photos in this book

60-4 to 60-16

F.R. Fosberg.

Book £58

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Collection and Field Note Book  
No. 58

(Sept. 10, 1960 - Oct. 15, 1960)

(41205 -- 41373)

Page

CALIFORNIA

Hayward, Alameda Co. 41205 ..... 2-3

NEW GUINEA

Port Moresby ..... 4-11  
Goroka ..... 12-13  
Mt. Michael from Goroka ..... 13  
Air trip Goroka-Mini ..... 14-21  
Wara Chimbu ..... 21  
Kujip ..... 41206 ..... 22-23  
Banz ..... 41207-41208 ..... 22-23  
Dona-Nondugl ..... 41209-41210 ..... 22-23  
Nondugl ..... 41211-41416 ..... 22-23  
Kerowagi ..... 41217-41218 ..... 24-25  
Wara Chimbu ..... 41219 ..... 24-25  
Womai ..... 41220-41224 ..... 24-28  
Chuave ..... 41225-41227 ..... 28-29  
Kenaki ..... 41228-41234 ..... 28-31  
Daulo Pass ..... 41245-41246 ..... 30-31  
Auto trip Goroka-Kainantu ..... 32-33  
Korefegu ..... 41247-41250 ..... 34-35  
Bena Bena ..... 41251-41255 ..... 34-35  
Aijiura ..... 36  
Auto trip Kainantu-Aijiura-Kassam ..... 37

Eastern Highlands

Ramu-Asano Divide... 41256-41261 ..... 38-39  
Aijura ..... 41261-41266 ..... 38-39, 44  
Arona Valley-Ramu-Markham Valley ..... 40-43  
Air trip Kainantu-Lae (Morobe Dist.)... 42-43-46-47  
Kainantu ..... 41268-41272 ..... 44-45  
Arona Valley-Ramu-Markham 41273-41277 44-45, 48-49  
Arona Valley ..... 41279-41282 ..... 48-49  
Aijura Hills ..... 41283 ..... 48-49  
Rupt. Haviland Mem. Lookout (above Kassam) 41284-41287 ..... 50-51  
Arona-Ramu Valley 41288-41291 ..... 50-51

Arona Valley.....	41292 .....	50-51
Kainantu.....	41293-41294 .....	52-53
Lae.....	41295-41500 .....	52-54
Kareeba, Keravat .....	41501 .....	52-53
Flight Lae-Rabaul.....		56-65
Keravat (Bismarck Arch.) .....		66-71
Flight Rabaul-Brisbane-Budapest.....	41502-41504 .....	68-71
Kaviena Airstrip .....	41505-41507 .....	70-71
Manus airstrip .....	41508-41511 .....	70-71
Tolai (info from J. Havel) .....		72-74
Air trip Rabaul-Kavieng-Manus-Wewak-Madang-Lae.....		75-94
Markham Valley (Morobe Distr.) .....		95
Oomsis Valley .....		96-97
Oomsis Creek .....	41512-41534 .....	98-101
Markham Valley .....	41535 .....	100-101, 105, 108-9
Oomsis Creek.....	41536 .....	102-103
outside Lae .....	41537-41539 .....	102-103
btwn Busu-Bufo Rivers..	41540-41543 .....	102-103
Busu River Road.....	104-105 .....	104-105
Erap River beds.....	41544-41547 .....	106-107
Old Naramonke village..	41548-41554 .....	106-107
Markham Valley.....	41555-41556 .....	108-109
Bufu River .....	41557 .....	108-109
Air trip to Port Moresby.....		110-113
from Lae		
<u>AUSTRALIA (Queensland)</u>		
Air trip Port Moresby-Townsville .....		113
Great Barrier Reef .....		113
Townsville-Brisbane trip .....		115-125
Auto trip north from Brisbane .....		126-137
Mooloolabah .....	41558-41579 .....	136-141
Maroochydore .....	41580-41582 .....	140-141
Air trip Brisbane-Gladstone .....		142-147
Boat trip Gladstone-Heron Island .....		148-155
Heron I.....	41583-41596 .....	150-151
	41597-41599 .....	156-157
	41300-41332 .....	156-157-161
	41333-41343 .....	166-167
	41344-41354 .....	172-173
Gladstone.....	41355-41356 .....	172-173, 178-179
	41357-41362 .....	180-181, 175-177
Erskine Island .....		174-175
Masthead Island.....		174-175

(SEE NEXT PAGE)  
for Australia (continued) and Hawaii I.

See Klemack book #59

AUSTRALIA (continued)

near Canberra, A.C.T....41363-41364 ....180-181  
Flight Gladstone-Brisbane .....182-183  
Flight Brisbane-Sydney .....184-186  
Flight Sydney-Canberra .....187-189  
vicinity Canberra (Pryor & Robbins)....190-191  
Flight Canberra-Sydney .....192-193

HAWAIIAN ISLANDS

Flight Honolulu-Hila-Molokai ..... 194  
Kii Flow ..... 41367-41372 ....198-199, 194-195  
Kapoho ..... 41373 ..... 198-199, 195-196  
Kimu Flow ..... 196-197  
Kilauea Iki ..... 41365-41366 ... 198-199, 197,200

B & W photos in this book

60-4 to 60-16

F.R. Fosberg.

Book # 58

begin with 41205  
ends with 41373

41500 - 41599 (p52-156)



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1960 California

41205  
Sept. 10 - Hayward, Alameda Co.  
*Jasminum*  
cultivated in garden

3

bushy shrub 2.5 m. tall,  
long arching branches,  
leaves all alternate (some  
approaching opposite),  
both simple and  
compound; flowers fragrant,  
bright yellow.

1960 Port Moresby New Guinea

Sept. 14 Port Moresby -

surrounded by dry hills with vegetation varying from savanna to open forest, with gallery forest along streams and ravines. The grass is dry. The trees are mostly small *Eucalyptus*. Some trees appear deciduous from the air, but few have ever seen on ground.

Small mangrove swamps at mouths of streams.

Area frequently burned fires set for amusement. This year fewer fires than usual, because of a few rains at favorable times. This is end of dry season.

Many double canoes in bay, homes of Hula people, a brown wavy haired group, fishermen, who come from two or three places where they have small footholds along the coast.

*Jatropha gossypifolia* abundant. *Tribulus*.

*Euphorbia cyathophora*.

*Tribulus cistoides*

*Ischaemum formosiana*

*Tricholoma* sp. rosea

Ornamentals around Port Moresby:

*Pedilanthus* sp. tithymaloides

*Polyscias scutellaria*

*Acalypha wilkesiana*

*Petunia*

*Delonix regia*

*Acalypha hispida*

*Cassia fistula*

*Mangifera indica*

*Plumeria rubra*

*Calotropis*

*Codiaeum*

*Peltaphorum*

*Cocos nucifera*

*Ipomoea pes-caprae*

*Carica papaya*

*Bougainvillea* spp.

*Plumeria obtusa*

*Musa sapientum*

*Ricinus communis*.

*Helianthus annuus*

*Polyscias tricholepis*

*P. guilfoylei*

*Terminalia catappa*

*Casuarina equisetifolia*

*Nerium indicum*

*Bryonia*

*Tamarindus*

spathocer

*Thevetia peruviana*

*Antigonon leptopus*

*Euphorbia pulcherrima*

*Alternanthera vericolor*

*Bauhinia*

*Canna* hybrids

The trees in the savanna and open forest are almost entirely *Eucalyptus* sp. and *E. alba*.

*Dahlia variabilis*  
*Pelargonium zonale*  
*Pedilanthus tithymaloides* (green,  
*Caladium bicolor* broad lf.  
*Nephrolepis* sp. brown.)

Air trip Port Moresby to Goroka  
 (DC-3) (started 12:27)

Large areas of the savanna have been recently burned and a number of fires were seen.

Followed the coast eastward, gradually getting inland.

12:32 - savanna changed to open forest, locally some very bare hills. Closed forest in ravines and becoming more prevalent.

Inland some sizable clearings on more level places.

12:35 mosaic of open forest & savanna and closed forest. Then generally savanna closer to coast.

12:36 some ponds and marshy river bottom-lands, meandering small rivers. Bottom lands green. Toward coast some bare saline ground and mangrove.

*Manihot esculenta* (variegated ornamental)  
*Tagetes*  
*Oximum basilicum*  
*Hibiscus* hybrids.  
*Polyscias fruticosa*  
*Pithecellobium dulce*  
*Coleus scutellarioides*  
*Lachnanthes officinalis*  
*Ageratum houstonianum*  
*Pilea microphylla*.

Meandering river paralleling course.

12:39 clouds.

12:41 Dense forest with meandering rivers and estuaries. Thin clouds.

12:47 Large estuary - clouds.

12:48 Said to be rubber plantations just inland, but covered by clouds.

12:49 more inland from west, but visibility none.

12:46-48 Savanna near coast, extensive marshes inland, with small wooded hills interspersed. The savanna brown, the marsh yellow-green. Some of trees on wooded hills deciduous.

12:50 clouds, with closed forest showing through holes.

1:13 Coast bends sharply to left of course. Clouds. Should be approaching Kerema.

1:48 Large hole in clouds - undisturbed montane forests - several landslide scars.

1:57 another, similar. some signs of shifting agriculture.

## 1960 New Guinea

1:53 More shifting agriculture.

1:54 Some hills completely denuded. Trails on ridge tops. Village on hill top. Soil an orange brown.

1:55 Country predominantly denuded. Scattered wooded ravines and steep slopes. Mostly green scrub or tall grass (or fern), small proportion of actual present cultivation.

1:57 More dense undisturbed forest on high rugged mountain complex.

1:59 Shifting agriculture again, on right, scarcely on left. On right vast cleared area.

2:00 Shifting agriculture on left, also from here on, predominantly undisturbed grassland with very little wood, except in ravines.

2:01 Some very degraded forest on high ridge tops, left. To right the landscape is like southern Guam, but with less forest.

2:03 A muddy small river on right. Steep grassy hills on left, like Guam. Prob. *Miscanthus*. Fairly level country ahead and to left. Some.

2:04 Some rather diffuse villages. crossed river, flowing ahead and left.

5140'

Broad rather uneven valley, predominantly grassy. Some villages, considerable agriculture.

2:06 Goroka - surrounded by grassland - little forest. Flat valley bottom partly cultivated.

## Cult. plants in Goroka

*Iresine herbstii* - flowering and growing to 4 m. tall, shrubby, enlarged nodes.

*Lagerstroemia indica*

*Araucaria cunninghamii*

*Gerbera jamesonii*

*Gaillardia pulchella*

*Pilea microphylla*

*Gladiolus*

*Coleus scutellarioides*

*Canna* sp.

*Tropaeolum majus*

*Monstera deliciosa*

*Alternanthera versicolor*

*Dianthus caryophyllus*

*Plymeria acutifolia*

*Beloperone guttata*

*Kalanchoe pinnata*

*Browallia*

*Begonia* spp.

*Kalanchoe* sp.

*Hosta* sp.?

*Hippeastrum* sp.

*Tabernaemontana coronaria*

*Cassia* ~~ffidymobotrys~~  
*Cosmos tinctoria*  
*Bambusa arundinacea*  
*Musa sapientum*  
*Cordyline terminalis*  
*Saccharum officinarum*  
*Cucurbita* sp.  
*Citrus* (rough skinned lemon)  
*Morus alba*  
*Hibiscus* (hybrid)  
*Euphorbia pulcherrima*  
*Mangifera indica*  
*Rosa* sp.  
*Petunia*  
*Grevillea robusta*  
*Delonix regia*  
*Cassia*  
*Eucalyptus alba* + *diglypta*  
*Adenanthera saman*  
*Casuarina* ~~equisetifolia~~  
 pendulous form.  
*Cupressus alba*  
~~*Cestrum cajan*~~  
*Crotalaria*  
*Duranta* spens?  
*Quisqualis indica*  
*Gardenia jasminoides*  
*Cynoglossum*  
*(Thelast.)*  
*Cupressus lusitanica*?  
*Datura arborea*  
*Aruncaria klinkii*  
*Catharanthus roseus*  
*Ipomoea batatas*

*Acalypha amentacea*  
 v. *villosiana*  
*Dahlia variabilis*  
*Salvia splendens*  
*Chrysanthemum morifolium*  
*Musa nana*  
*Florbergia grandiflora*  
*Adenanthera saman*  
*Zephyranthes rosea*

Sept. 16 Grassy hills  
above Goroka

(photos - last b. n. roll,  
first on Kod. roll #1, if with  
one up valley toward Mt. Otto.  
Casuarina forest, alluvial  
terraces, etc.)

Grassland very  
inhomogeneous. Short  
grass - *Pennisetum clandestinum*  
with ~~for~~ *Themeda australis*.  
Patches and invasion  
of *Themeda gigantea*,  
some *Pennisetum* ~~bedigynum~~,  
*brachystachyon*, various  
other grasses - *anthoxanthum*,  
*Capillipedium* <sup>navigerum</sup>, *Sorghum nitidum*, *Imperata*.

Soils, with a dark  
brown-black layer underlain  
by ~~brown~~ <sup>red</sup> clay, total depth  
to rock 1 m. on upper slopes,  
several times that lower down.

*Youngia japonica*, *Pteridium*,  
*Crassocephalum*, *Osbeckia*,  
*Blumea*, *Thelypteris goggiiodes*,  
*Fimbristylis dichotoma*?  
*Polygonia*, *Centella*,  
*Fimbristylis ferruginea*?  
*Eueraria lobata*, *Crotalaria*,  
*Trifolium*, *Oxalis*, *Bidens*,  
*pilosa*, *Congya*, *Cynoglossum*

Generally a dense  
rather fine grass about

1 m. tall, varying to  
somewhat shorter,  
more usually to ~~too~~ taller,  
even twice as tall, with  
patches of coarse grass  
(*Themeda australis gigantea*)  
to 3 m. or more.

On flat terraces in  
Goroka the soil is a  
black fine soil like  
an Andosol soil.

Sept. 17 - Mt. Michael  
from Goroka -

Slopes densely wooded,  
very steep - cliffs of bare  
rock part way up.

Top ridge bare, alpine  
grassland on the uppermost  
slopes above an irregular  
but sharp timber line.

The ridge to west of  
Goroka is mainly grassy  
but the higher parts  
of it have a sparse  
rather degraded forest, low  
edges very ragged and  
degraded. Forest lower to  
with <sup>abundant</sup> level of valley at extremes  
with end.

Sept. 17 - trip by air from Miln Bay to small otter cabin plane (seated in st. copilot seat). Weather completely clear except for localized low cloud layers or "ground fog".

First stop - north to Mt. Wilhelm

Patches of young canarium abundant in grassy, altitude valley floor. These seem to be planted especially in the cultivation.

Ravines are irregularly bushy.

(photo b. & b. start of brand)

Sketches 'b' of area of valley in present cultivation, much of rest in fallow but showing pattern of cult. patches.

Mts. around head of valley with steep upper slopes, ridges, peaks densely wooded, then fading out into grassy slopes with scattered cassava patches, as ridges and slopes become less abrupt grass follows ridge well up into forest. Trail on all these ridges. River in head of valley not at all muddy.

b. b.  
b.

Photo

Ravines not conspicuously more wooded than slopes in transition zone. They slopes with a mixture of small brush and large grass, not, *Miscanthus*.

Upper slopes thickly wooded, but canopy has a looser appearance than is usual in other up. mts. Occasional bare landsted areas.

Considerable complex of ridges here apparent, s.e. of Mt. Wilhelm. The almost all wooded but some clearing, locally on lower slopes and in larger valley. On very large valley s. of Mt. Wilhelm almost entirely cleared.

Large area of tall tall, alp. grass and on top of Mt. Wilhelm. Timber line sharp but with broken isolated patches of brush interspersed locally with grass. No conspicuous thinning of scrub upward.

In upper montane forest on slopes are some dead trees. Canopy generally loose, but otherwise

typical of mountain forest. Apparently the elior wood belt is narrow here.

West of Mt. Hagen is another very sharp rugged high peak with a small area of grass on top, mixed with patches of ~~shrub~~ scrub.

Crossed south of this into a large valley, all in shifting agriculture with patches of ~~grass~~ grass.

Headed ~~into~~ this valley, ~~upper~~ past a broad plain grassy or cultivated with a fairly large meandering river, rather muddy, but not excessively so.

Fluvial, curves and goes out of the broad valley through a narrow part which doubles back.

Rather little cultivation in this broad valley in proportion to grass.

Apparently Minj is at the curve in the river where the broad plain ends into the narrow valley.

Planted here on a long flat strip.

Left Minj by road soil of plain deep and black. Imperata is dominant grass.

Cultivated patches of bananas and sweet potato.

Upper Wahgi Valley is a lake bed where old valley was dammed by lava flows of Mt. Hagen. River reversed its direction, then, and flows out through Chimbu Gorge.

Phragmites bearkeri in ravines and wet places.

(bot. coll. B) of ~~water near Minj~~

Crotalaria (laburnifolia) common, anagyrusidae maggots

Ravine walls, usually where steep, with tangled scrub or scrub forest where less steep, sweet potato.

Patch of Araucaria cunninghamii - represent original veg. of valley.

Ornamentals very abundantly planted around cult. patches, along roads, around dwellings.

Cordyline terminalis, a very narrow lfd. var. used for living fences.

Broad alluvial terrace dissected by ravines. Soil dark gray, subsoil reddish.

Sweet potato patches with ditches. Barovas.

Across from ~~Bang~~ Bang. Some large ravines with gallery forest. *Brassica actinophylla* flowering. is a branched small tree, not a strangler, here. (bod. also of natives with saponin).

*Homalanthus propinquus* is much like *Croton heterophyllum* in same situation in Andes.

*Dodonaea viscosa* very common in fields and fence ~~rows~~ rows. small tree.

*Trema* and *Alphitonia* common secondary trees.

*Alphitonia* bark to ~~soot~~ used for saponin and astringent properties.

Kuijip.

Crossed valley.

Bamboo with dense clumps of culms, with relatively thick walls, internodes about 25 cm. long, green, flowering at ~~at~~ uppermost internodes of culms.

long whip-like tips pendent.

Coffee plantation, on flat terrace, not or scarcely shaded.

Soil sandy, top horizons black, changing to yellow-brown downward, becoming gravelly. (b.w. ~~just~~ also of Wahge R. bridge and Phragmites flat.)

Grass near Bang largely

*Ischaemum* sp.

Bamboo. *Euphorbia*.

*Crotalaria* used for temporary coffee shade.

Doma - hills on side of valley. ~~Or~~ photos across valley, showing truncated spurs of terrace on other side and grassy plains. *Grevillea* *frapuana*.

Long-sing village of Warum tribe.

Temporary village with long houses thatched with *Miscanthus* ??

not divided into rooms, but with many doors on both sides. Side walls of wattling of split wood uprights, horizontal bamboo members, and upright *Pandanus* leaves.

Tobacco and taro cult. bananas, sugar cane.

shaded lightly by casuarina, Sterculia, and a number of other trees - Teak, bamboos,

Bamboo flute called "mengas" one internode with no septum, hole near septum. part on other side with 2 points left.

### mondugl

bamboo - dense clumps, the foliage making a very compact sub spherical mass.

Coffee plantation - shaded with Leucaena. breeding birds of paradise & crowned pigeons.

Many cultivated things, some brought in from forest.

From Mondugl to Kerowagi hilly country, mixture of thicket, grass, cultivation.

Toward Chimbu there are Casuarina groves mixed with grass and cultivation. The gardens are deeply ditched, the patches 2-3 m. across,

Jic. Kerowagi  
Mainly sweet potatoes and bananas  
*Pennisetum clandestinum*, introduced, forming mats on road embankments.

Sept 18 (Chimbu) Kundiana  
2 hds. 3 bds. of denuded hills in different directions.

Sept. 18 - Wara Chimbu below Kundiana (Chimbu) photos of steep deforested grassy gorge wall. (b+w)  
*Euphonia* sp. coll.

Between Kundiana and Daulo Pass there is a great abundance of *Casuarina oligodon* in sparse patches and scattered trees in cult. ground and grassland. planted by natives, allowed to branch perhaps 2-30 cm. diam.

Sept. 17 - vicinity of Kuijip,  
above Bany, Wahgi Valley  
41206 *Bambusa* *nastus* *elatus* Holttum.  
several clumps along  
road, common and general  
in thickly settled cultivated  
and grassy valley

Sept. 17 near Bany, Wahgi Valley  
cultivated hill with  
thickets

✓ 07 *Bambusa* *nastus* *elatus* Holttum  
common

✓ 08 *Grevillea papuana*  
common in thickets

Sept. 17 bet. Doma and Nondugl  
temporary village on 'sing sing' ground.

✓ 09 *Arancaria*  
one tree seen

✓ 10 *Ficus dammaropsis*  
occasional

Sept. 17 - Nondugl, Wahgi Valley  
planted around aviary  
in coffee plantation

✓ 11 *Bambusa*  
uncommon in area, planted

✓ 12 *Cupressus lawsoniana*  
planted

3-10 m. tall,  
dense clumps, culms  
slightly spreading, arching  
at top, green, internodes  
about 25 cm. long, thick walled,  
flowering in top few  
internodes of culms.  
(several clumps represented  
in collection).

~~culm~~ culm sheath  
and top of a young shoot  
(similar to 41204).  
small tree 4 m. tall,  
fruit immature.

small sterile tree, about  
3 m. tall.  
small sparsely  
branched tree.

dense clump, whole  
presenting a subglobose  
appearance, about 6-7 m. tall  
sterile shrubs 2 m. tall,  
aromatic.

24 1960 New Guinea

41213 *Libocedrus*

2 planted, brought in from forest.

2 14 *Ficus adenosperma*

Planted, brought in from forest

2 15 *Ficus steroides*

Planted brought in from forest

2 16 *Bambusa*

Planted

Sept. 17 vicinity of Kerowagi,  
Wahgi Valley

2 17 *Ficus adenosperma*

common along ravine sides

2 18 *Smilia pteranthoides?*  
on clay road cut

Sept. 18 Wara Chimbu, just  
below Kundiawa (Chimbu).

4 19 *Euphorbia*

Planted along roadsides  
throughout region

Sept 18 - Womai, between Kundiawa  
and Chuaot, Wahgi Valley  
in brushy ravine cut in limestone

1 20 *Polyodium*

rare on rocks

1 21 *Navallia*

rare on rocks

1 22 *Carex*

rare on ~~the~~ gravelly debris

3 23 *Carex*

rare

25

small tree, about 5 m. tall,  
leaves glossy.

small tree, with seed figs,  
immature.

fig fusiform, immature.

dense clumps,  
culms slightly diverging,  
arching at top, tips pendent.

small tree, 4 m. tall,  
gall ~~water~~ figs immature.  
foliage firm, purplish,  
upper <sup>surface</sup> flowers white, well  
exserted.

shrub 3 m. tall, lactiferous;

culms erect

Sept. 17. Womai

brushy ravine in  
grassy limestone area  
loosely and irregularly  
wooded with casuarinas

~~And~~ Nintul - scattered  
oaks, *Gmelina*, *Finschia*,  
*Pandanus* groves, grass  
(*Miscanthus* + *taichuanus*  
*robustum*), cultivated  
patches (sweet potatoes,  
*Rungia* - used for greens),  
*Casuarina*, etc.  
(photos of *Pandanus* + *Castanopsis*)

Obave - slope  
partly covered by open  
*Casuarina*, *Phragmites*,  
in wet spots some cultivation.  
*Drosera* on wet road cut.  
Ficus on rock *Pinonius* or rock

Kerabi - steep canyon  
wall, soft disintegrated  
sandstone

*Rhododendron*, *Casuarina*

Daulo Pass 8175'

broken down ~~by~~ montane  
forest - scattered ragged  
trees - *Notisporus* has  
been logged out.

*Neptera* on cut banks -  
closely adhering to bank,  
except some cushions of  
flowering branches which  
are erect.

Trees to ~~up to~~ 25-30 m.  
tall umbrella tops.

Dense tangled undergrowth  
of climbing bamboos,  
*Rubus* spp. and many  
shrubs, *Muscatibus*,  
etc.

(photos ~~down~~ end roll 38  
1st. 4 on roll 4)

Soil a deep orange red  
clay, cracking conspicuously  
when dry.

Cultivated ornamentals  
planted everywhere along  
roads and trails -

~~is~~ *eg* *Resine herbsta*  
*Ficus iodotricha* Sib., shrubby  
fig with insects (given only to me) <sup>see later</sup> 7. Feb. 1960  
below Daulo in Asaro Valley 1960

28

1960 New Guinea

41224 *Pyrosia*

2 common on rocks

Sept. 18 - Chuave, Wahgi Valley  
slopes with secondary vegetation.3 25 *Drymaria*on ~~clay~~ vertical clay road cut3 26 *Ficus virgata*

on large rock

2 27 *Timonius*

on large rock

KerabbiSept. 18 - Kerabbi, below  
Chuave, in Wahgi Valley

8

1 28 *Rhododendron*

on steep wall of rotten sandstone

1 { 29 *Casuarina oligodon* Johnson (incl.)abundant throughout  
regim, planted by natives.erect shrubs 1-2 m. tall,  
flowers dull orange.  
small trees, branches  
pendent.Sept. 18 - Danlo Pass,  
bet. Wahgi and Asaro Valleys  
in degraded montane forest

8200'

2 31 *Viola*common on vertical banks  
and cuts.stems rather thick,  
prostrate; flowers lavender.1 32 *Solanum*

occasional along trail

spreading loosely  
branched shrub, fruit immature.  
erect, suffrutescent, sterile.3 33 *Amaracarpus muscoso*

rare

caespitose, fronds arching.

2 34 *Sphenomeris*

occasional, terrestrial

29

30 1960 New Guinea

41235 (cont)  
2 common  
2 36 (cont.) *Pipturus*?  
occasional  
3 37 *Miscanthus floridulus*  
common  
1 38 *Ophiurhys*  
rare, terrestrial  
3 39 *Sathelyptis*  
local, terrestrial  
2 40 *Piper*  
common  
2 41 *Nertera*  
local, on vertical clay bank  
2 42 *Nertera*  
same  
2 43 *Viola papuana*  
common in open grassy spot  
3 44 *Caes*  
rare, one clump seen  
height .12 - below Dauls Pass,  
on ~~old~~ road to Goroka,  
on wet talus near stream  
3 45 *Epilobium*  
common locally  
3 46 *Polygonum*  
locally abundant

31

shrub 1.5 m. tall, spreading.  
shrub, leaves <sup>greenish</sup> white beneath  
clumps, culms erect,  
1.2 m. tall; flowering spikes  
deep purple.  
erect, leaves whitish beneath,  
fruits <sup>dark</sup> purple.  
shrub 3 m. tall, leaves  
white beneath, fruits  
turning yellow.  
prostrate, closely adhering  
to ground by roots at nodes,  
locally flowering stems  
ascending; flowers greenish  
yellow; fruit orange-red, fleshy,  
same but sterile.

leaves and scapes erect;  
flowers white.

Sept. 20 - trip by auto Goroka to  
Kainantu

Grassy hill with a  
pattern of "short grass", Imperata,  
and Phragmites - local colonization  
by *Alpinia*, *Vaccinium*, <sup>wendlandia</sup>, etc.

Korepela - outcrop of  
hard almost black limestone  
vegetation reduced to weeds -  
*Bidens pilosa*, *Digitaria* sp.,  
*Eleusine*, *Triumfetta batatas*,  
etc. *Bryonia*? about the  
only native thing.

*Acalypha* + *Pipturus* fles.  
near Henganofoi. Benabena  
toward Henganofoi.

Ravine with gallows  
scrub

*Schefflera* sp.

*Acalypha* sp.

*Pittosporum*

*Glaeagnus*

*Ficus* sp.

*Wendlandia paniculata*

*Sitsea domarrensis*

*Bischoffia*

*Piper*

leaf?

*Cudrania javanica*

tangled, to 5 m. tall or less.

hill, being colonized  
by *Grevillea*  
(~~Alpinia~~ & ~~and~~)

bet. Bena Bena and Henganofoi

Ramu - Asaro Divids  
degraded Nothofagus -  
castanopsis forest  
with thick undergrowth.  
*Cinchona pubescens*  
var. *succinifera*

occasional locally, planted.  
Mostly the trees here  
near the road are  
small, quite a mixture  
of species.

Scattered trees from  
original forest 25-30 m. tall -  
even a *Pandanus*.

Weeds abundant

34

1960 New Guinea

Sept. 20 - Korfegu, south of  
Bena Bena.41247 *Breynia*1 rare in soil pockets of ~~soil~~  
in outcrop of hard limestone in grassland3 48 *Pipturus*one tree on slope below limestone  
outcrop in grassland.3 49 *Acalypha*several trees on slope below  
limestone outcrop in grassland.43 50 *Acalypha*several trees on slope  
below limestone outcrop in grassland.

Sept. 20 - south of Bena Bena

toward Kainantu

in bushy ravine in  
grassland3 51 *Ficus adenosperma*  
occasional2 52 *Cudrania parviflora*  
occasional, scrambling3 53 *Acalypha*  
common around edges2 54 *Elaeagnus*  
common5 55 *Breynia*  
common

1500

1550 M

5000' ±

Eastern Highlands Distr. 35

small tree or large shrub,  
3 m. tall, fruiting heads  
white, fleshy.small tree or large shrub,  
pistillate aments only.small tree or large shrub,  
pistillate and staminate  
aments.large shrub 3-4 m. tall  
(gall figs)scandent shrub,  
fruit orange.shrub 1-1.5 m. tall,  
staminate aments  
well down on branches,  
scandent shrub.flowers cream-white,  
ripe fruit red, fleshy,  
cylindric.

shrub 1.5-2 m. tall

Sept. 20 Aspira, near Kainantu  
agricultural exp. sta.  
3 hrs. + down of hills above,  
showing cleared slopes,  
woods on top of higher  
hills.

Some patches of good  
forest above station.  
Tall montane forest,  
trees to 30 m.

*Musa ingens*, an  
enormous banana, 10-15  
m. tall, approaching  
Cocote in some characters,  
such as open sheath,  
general habit, somewhat  
persistent bracts,  
infl. enlarged distally.

Kainantu Valley generally  
grassy, a broad flat old  
lake bed with hills  
arising from and around  
it, all grassy, some  
ravines wooded, at least  
in their upper parts. Remnant  
of forest on upper slopes.  
Phragmites marshes  
in ~~lower~~ flat parts.

Sept. 22- Auto trip, Kainantu -  
Agiuna, ~~and~~ Kassam.  
Photos of *Musa ingens*  
in degraded forest above  
Agiuna. Tall trees with  
understory of *Piper*, *Pandanus*, etc.  
Coll. *Homalanthus*, *Gastrularia*,  
aeration.

Arona Valley - mostly  
cleared but with  
patches of forest, esp.  
on slopes and in ravines.  
*Elmerilla papuana* Dandy. <sup>but tops</sup>  
Some woody plants  
general in ~~scrubby~~  
grassland. *Vaccinium*, <sup>deciduous</sup>  
at high alts. *Podonaea*,  
etc. *Demecarpus*.

Lower, flatter parts  
open grass, predominantly  
*Imperata* but with a  
number of other things  
and scattered ~~termites~~ ant  
bait mounds.

(Photos from)  
Native <sup>use to</sup> plant taro in  
wet season, this not seen now.  
This valley is very sparsely  
populated, little cultivation seen.  
Large cattle experimental project.

Sept. 20 - Ramu-Asaro Divide,  
(road from Goroka to Kainantu) Kainantu  
in degraded *Castanopsis*  
*Nothofagus* forest.

41256 *Cinchona pubescens* var. *minima*  
2 one large tree, probably planted,  
and a number of smaller ones.

3 57 *Eugenia nitida*?  
4 58 *Acronychia*  
occasional

2 59 *Nothofagus macrophylla*  
common

2\* 60 *Medinilla*  
~~scandens~~ occasional

2000M  
6500' t  
subdist.

tree 10 m. tall, flowers  
pink without, pale within,  
very fragrant.

small slender tree or large  
shrub, flowers white.

strictly erect shrub,

small sterile tree

scandent shrub  
or vine climbing  
in trees; inflorescences  
scarlet; leaves with  
purple veins.

Sept. 21 - Aiyura, near  
Kainantu, Kainantu subdist.

1 61 *Drymaria cordata* (L.) Willd.  
weed in experiment station grounds

2 62 *Plectranthus*  
weed on road cuts

3 63 *Desmodium*  
weed on roadside

3 64 *Aranearia cunninghamii*  
planted in experiment station

2 65 *Gaertnera* GAERTNERA  
in degraded forest on hill

4 66 *Ageratum houstonianum*?  
common along roadside  
(to 1044)

1500  
5000' t

1700  
5500' t

1500  
5000' t

1500  
5000' t

prostrate.

herb with long decumbent  
base, flowers blue.

shrub 1 m. tall;  
fruit dry.

straight tree 20 m. tall,  
cones disarticulating,  
seeds picked up from ground.

scandent, inflorescences  
white, flowers white.

heads purplish to whitish,  
herbage aromatic.

Sept. 22 - divide bet

5000' - Aroma Valley and the  
Ramu - Markham Valley.

Dense tall forest  
with abundant  
climbers and climbing  
epiphytes. A large  
climbing bamboo.

Tangled thickets below  
trees at least near road.  
Climbing bamboo has  
culms scattered, slightly  
decumbent at base, to 6-8  
m. long, high arching,  
smaller culms branching,  
and with distichous  
broad leaves.

Rupert Haviland Memorial  
Lookout. ~~Pass~~ slopes of

Ramu - Markham Valley

Steep slope, tall forest,  
30± m. with scattered  
*Araucaria heterophylla*.

Many of trees bearded  
with *Vitis*. Trees  
mostly not more than  
1/2 dm dbh, mostly less,  
canopy ~~is~~ irregular,  
not completely closed,  
a thin irregular second  
story, a sparse to dense  
shrub layer mostly of  
tree seedlings, lianas common.

4000'

5000'

4500'

*Pandanus*, a narrow  
leaved one common in  
under story and shrub  
layer, ferns sparse  
on ground. Has been some cutting.  
Generally few epiphytes  
but some trees with  
many

(photos of slope & of  
*Araucaria* (b. w. end roll 4)  
& rod.)

Some clearings on  
steep slopes. Spurs  
running down into  
valley mostly cleared.

Above this a steep slope  
of broken dark hard rock  
(sample 1) - boulders to 10-15  
ft. diam. from some exposures  
this seems almost in place,  
merely broken off.

At top of pass *Musa ingens*  
is common in tall montane  
forest.

Down on the ~~the~~ Aroma side  
the forest is very fine  
but shifting agriculture  
is eating into it.

Trees with rounded, umbrella  
shaped crowns 30-35 m. tall.

no significant intermediate story of low tree or tall shrub layer.  
Many lianas.

Arona Valley - nearly burned Imperata with ant mounds (3+ w)

Arona V. slopes up to pass to Arima.

*Decaspernum neurophyllum*  
on steep slopes in grass.  
Clump of *Miscanthus*, a  
very erect form, quite tall,  
to 3 m.

Thin woody growth  
on still higher slopes largely  
*Vaccinium* (possibly *Blepharocalyx*).

Sept. 23 - air trip Kainantu  
to Lae, down Markham V.  
(DC3)

Small coffee plantation  
at Kainantu.

Grassland with wooded  
ravines. Small areas of  
cultivation. Round thatched  
huts on ridges.

Range of hills mostly  
wooded, then Arona V.  
grass, burned areas  
steep ravines wooded.

Grassland around Kainantu  
a dense grass about 1 m. tall,  
with a mixture of *Arundinella*,  
*Sorghum*, *Themeda australis*,  
*Capillipedium*, *Fimbristylis*,  
etc. with *Pteridium*,  
*Thelypteris unita* scattered  
through it. Woody plants  
commoner at higher altitudes  
and on steeper slopes  
and ravines. This is  
a slender stemmed  
grassland, fully covering  
the ground. Deeper ravines  
are wooded. Around  
Kainantu there has been  
some planting of *Aravea*.

*Casuarina* <sup>paperana</sup> along streams in  
flatter parts.

Then over higher wooded  
range to Ramu - Markham  
valley.

Old lake bed with  
brownish grassland of  
*Lacharum spontaneum*.

In Markham stretches  
of green Imperata, partly  
newly burned, with  
patches of coconut plantation  
etc. - scattered trees  
& patches of wood.

Steep slopes on right

44 1960 New Guinea

41267 *Homalanthus populneus*  
common in degraded forest and on forest edges

Sept. 22 - Kainantu  
on grassy gentle slope

✓ 68 *Sorghum*  
common

✓ 69 *Themeda australis*  
common

✓ 70 *Capillipedium*  
common

✓ 71 *Pteridium aquilinum* var.  
common

✓ 72 *Arundinella*  
common

Sept. 22 - divide bet. Arona Valley  
and Ramu - Markham Valley  
in thick tangled montane  
broad-leaved evergreen  
forest on steep slope.

✓ 73 (ord.)  
terrestrial

✓ 74 *Ophiomorpha*

✓ 75 *Ficus subulata*  
epiphytic, developing a  
slightly strangling habit.

✓ 76 *Ficus agapetoides* Diels  
det. corner

1550 m. 7. eastern Highlands, di. 45  
small tree 5 m. tall.

✓ erect, ~~inflorescence~~  
golden brown.  
ascending  
"kangaroo grass"  
erect, panicle purple.  
rhizome buried;  
fronds up to 1 m. tall  
(to 2 m. in other areas)

✓ stem decumbent, spike erect;  
perianth pinkish-bronze color,  
lip yellow  
buds reddish, flowers white.  
leaves pale beneath,  
epiphytic, developing a  
slightly strangling habit.  
figs immature.  
climbing in tall trees,  
rooted in ground; stems  
1-2 cm. diam. sterile.

completely denuded except ravines, badly eroded.

Markham River has most amazing system of braided shifting channels over whole valley floor.

Large areas burned. Patches of forest left, scattered trees on some of red, lone grass marked by old channels. At least 20-30% recently burned.

Large flat area solid brown grass, no tree.

Left side, also, very steep, denuded, much erosion, denuded except for bottoms of deep ravines.

Broad alluvial fan areas mostly in grass, but partly cultivated, crossed by wide braided gravelly stream beds joining Markham.

Lower down, foothill zone very broad, grassy. Alluvial fan zone also broad, with patches of wood and savanna, much grass, cultivation. Large air-strip & reservoir, Nadzab base from wartime.

Lake Wanam surrounded by grassy hills. 200' above river.

Then valley narrow, river runs through a flat, densely wooded valley bottom between densely forested hill. in a single broad channel. out to waste plots at Lae, this also forested, but irregularly, with some clearings, etc.

48

1960 New Guinea

41277 *Ficus hypophloeoides*, Schlecht.??  
d.c. cane.1 78 (bamboo) *Bambusa (teleba) atra* Lindl. group  
commonSept. 22 Arona Valley,  
slopes down from divide  
above Aiyura2 79 *Elmerilla papuana* Dandy  
patch of wood in ravine4 80 *Dendrobium*  
locally common.  
highly sparsely wooded  
steep slope in grassy hills2 81 *Urena lobata* L.

in semi-shade

2 82 *Vaccinium blepharocalyx*?  
common

Sept. 22 - hills above Aiyura

4 83 *Miconia*?  
common in degraded  
brushy woods.

49

~~dead~~ woody climber,  
climbing in tall tree.  
culms scattered not  
clumped slightly  
decumbent at base,  
high arching, to 6 m. tall.tree 10 m. + tall, buds  
and fruits only.stem up to 2 m. long,  
curving; flowers buff,  
purplish outside, odorless  
at 5 p.m.~~slender~~ slender shrub, -1.5 m.  
- tall; flowers rose pink.  
small tree 4-5 m. tall,  
stems.scrambling through  
thickets; heads white.

Sept. 22 - Rupert Haviland  
Memorial Lookout, steep  
slopes above Kassam,  
Ramu-Markham Valley  
in rather brushy tall  
forest on steep slopes

41284 (bamboo) *Nastus* sp.  
2 common in edges  
3 85 *Cordyline*  
common in loose undergrowth  
4 86 *Dioscorea*  
in understory  
2 87 *Dryopteris* (Ruttmohra)  
common, ~~as~~ terrestrial

Sept. 22 - Arona - Ramu Valley  
Divide, Arona side

in thick tall forest

#3 88 *Amaracarpus*  
occasional in undergrowth  
3 89 *Psychotria*  
~~occasional~~ in undergrowth  
3 90 *Psychotria*  
common in undergrowth  
2 91 *Mucuna albertisii*  
common climbing  
in trees.

Sept. 22 - Arona Valley,  
high grassy slopes, common

3 92 *Decaspernum neurophyllum*

tangled, slender hollow  
arching canes. sterile  
- shrub up to 1 m. tall;  
fruit immature,  
- panicle drooping.  
small tree, about 8 cm.  
dbh. 3 m. tall; fruit  
immature.

shrub 3 m tall.

slender shrub 3-4 m. tall;  
fruit green, turning yellowish.  
shrub 3-4 m. tall;  
- fruit soft, red.  
heavy woody liana,  
many m. long, flowers  
in racemes from tubercles  
on woody stem, scarlet.

shrub 3 m tall, petals white.

Sept. 21 Kainantu  
on grassy gentle slope

41293 *Fimbristylis*  
common

2 94 *Ophiurus*?  
common

3 95 ~~Spermacoce~~ <sup>Thespesia</sup> *subfruticosa* Jacq.  
common along roadsides

2 96 *Spermacoce oxyoides* Burm. f.  
common, edges of lawns  
and roadside ditches

3 97 *Hedysotis corymbosa*  
common in edges of garden

1 98 *Emilia sonchifolia* (L.) DC.  
rare in garden

99 *Phyllanthus*  
common in garden

(these next numbers were duplicated and  
have been changed, through 41299)

41500 *Phyllanthus amarus* Sch. & Th.  
rare in gardens and roadside

Sept. 26 - Kainantu, Keravat,  
New Britain ('near Rabaul')

41501 ~~41500~~ *Artocarpus*  
rare in primary forest, somewhat  
altered, but not recently  
disturbed

<sup>102</sup> Changed from 41200-01 to 41500-01

small tufts

10 m.

plant erect, tending to  
be purplish; corollas  
pinkish white.  
flowers white.

erect, corollas white,  
slightly campanulate,  
readily caducous.  
flowers lavender.

~~oblique~~ rachis of flowering  
branchlets broad, dorsally  
compressed, leaflets closing  
when plant is uprooted.

10 m.

sapling 3 m. tall, sterile.

Sept. 24 - Lal

cultivated plants seen:

*Codiaeum variegatum*  
*Spathodea campanulata*  
*Plumeria rubra*  
*Plumeria obtusa*  
*Angiopteris evecta*  
*Crocos mucifer*  
*Allamanda cathartica*  
 var. *hendersonii*  
*Tectona grandis*  
*Ralandoe pinnata*  
*Caladium bicolor*  
*Barringtonia asiatica*  
*Musa sapientum*  
*Peltophorum ferrugineum*  
*Hibiscus* hybrids.  
*Mangifera indica*  
*Jasminum sambac*  
*Ceiba pentandra*  
*Lachnanthus officinum*  
*Areca catechu*  
*Samanea saman*  
*Melia azederach*  
*Clerodendrum* sp. (like spec. but sm. fl.)  
*Euphorbia pulcherrima*  
*Cassia grandis*  
*Croton sp. diglypta*  
*Vanda miss Joaquin*  
*Pieffentbachia* (spotted)  
*Antigonon leptopus*

1960 Nov. 19

Sept. 26 - flight from  
Lae to Rabaul (DC-3 left side)  
left 6:17

Flats n. & s. of Lae are mostly  
wooded except for several grassy  
clearings and the braided river  
course which is variously  
brushy or open.

To eastward there is an  
area of low vegetation, then a  
series of wet meadows or  
vegetated lagoons. Then  
a sloping grassy clearing  
with gallery wood, then  
another stream on a large  
alluvial fan, mostly  
wooded but with some  
meadows. Two large  
clearings or meadows with  
Imperata (?) on slopes, surrounded  
by forest. A clearing opposite them  
on the coast. Another clearing  
with gallery wood and another  
stream then on an alluvial  
fan. This coast seems to  
be a coalescence of alluvial  
fans at the foot of high  
wooded mountains. Beyond  
stream some partially cleared  
land, then hills & reach the  
coast. A small lagoon behind  
a ~~series~~ of projecting ridge  
is cut off by a wooded bar.  
After this the steep wooded

6:36

6:37

mountains come right  
down to the coast.  
Another stream comes  
down a narrow valley.  
All of the streams  
seem to have braided  
beds covered with gravel.  
East of this several  
grass meadows of 100's  
sq. m. flat areas near  
coast, possibly small  
lakes.

Mountains, doubtless  
the Finisterre range, all  
densely wooded except  
a few patches near coast  
which seem partly cleared  
but somewhat brushy. In  
distance the highest peaks  
seem to be in mountain  
meadows. A fairly large  
river with braided bed.  
This river grassy.

Montane forest spott. but  
with tree ~~is~~ mostly naked  
out. Canopy generally  
solid except for a few  
few large shade trees.

No obvious trails or paths.  
Clearings, shifting agricultural,  
suddenly common in various  
stages of regrowth occupying  
most of areas with trees  
principally in ravines and

highest ridge along course, and extends well inland.

654 crossed coast line. Narrow coastal strip with no flat coast further. A small air strip on a peninsula (Finchhafen?). Inlets on a broad peninsula largely in grassland but with wooded ravine and patches - grass on gentle slopes, ground and ridge sloping down to coast. Inters. wooded above a couple of hundred meters.

flew over a series of reefs, now breaking water, the northern most one crescent shape open to north, except for a small patch.

658 several more, one an almost complete small circle. Several more, showing a striation pattern, not well oriented. sighted New Britain coast ahead and to left.

707 Cape Makira in distance to left, small islet west of it.

708 Many small islets mostly

approach. Mangrove covered vegetation low in center, higher around periphery, bounded by muddy-looking reef flats with a few scattered mangroves. Coast of New Britain with a strip of mangroves, then also with higher trees on periphery. Solid forest on flat to gently sloping ground inland. Becomes very slightly hilly with several very small streams, water not visible. More hill in middle distance to left. No clearings at all.

Becomes more hilly, or mountainous, but not especially rugged. Very densely forested. Locally a few trees seen to be bare.

710 Clouds rather bad, continuous rainforest. Ravines trending across course at about 45° degree right of it, but very temporarily, become quite irregular.

712 Rather large meandering ravines some distance to left roughly follow course,

getting closer the foliage  
on both swining ~~with~~  
with the south, an  
east. clouds curiously following rain.  
7.15 First tiny village, just  
on course, with several tiny  
clearings, mostly regrown.  
Otherwise solid forest.  
7.16 Course with coast indistinct  
topography, locally flat,  
locally a close complex  
tiny relief, like a densely  
wooded bank. Forest  
extends to coast, apparently;  
a few clearings immediately  
backed coast.  
7.17 Crossed a range of hills  
trending northeast.  
Approaching more closely  
the coast, I roughly  
paralleling it.  
still solid rain for the rest  
some shifting agriculture  
near coast. Bare or nearly  
leafing out trees occasional.  
Crossed a river going directly  
north to coast.  
7.18 A large complex of lagoons  
and marshes, surrounded  
by swamps, mostly fed by that sea.  
7.19 This changes back to forest.  
Hills again, with some  
sharp mountains near sea.  
7.20 A broken peninsula, bending west

well inland east of it  
7.21 Approaching coast, crossed  
a meadow - then  
a flat at most planted  
to coconuts, one or two simple  
buildings. A small lagoon,  
hills just east of coast  
forested except for some  
shifting agriculture near  
west. Small irregular  
peninsula.  
7.22 Reached coast. Very  
tawny sand, very muddy  
fine reef.  
Coast line along course  
mouth of large stream  
joined to this coming together  
as from west bay up. The  
lived by simple marsh  
(bogot)  
7.23 Another small stream  
estuary, bar, a few small  
bene open marsh, green,  
palm swamp and  
some sparsely, tall grass  
coast which goes away  
northward.  
7.24 Passed Mt. Uchela - a volcano  
con. wooded to top.  
7.25 Flew directly over a volcano  
with green wood and great  
eruption scars showing much  
sulphur and lava  
and just very flat

higher

sharp, con., wooded to top  
but more than toward top.  
Several small cones on a  
peninsula

732 Corral, good again, flat land  
in middle, agriculture.

Some reefs off shore, patches

Williamson Peninsula bend north in  
distance, with a bright shore  
mt. volcano to west, small, steep, conical,  
and many tree islets south  
of mt. (Garma Island)

Beyond Sh. bulk the distal  
part of the peninsula becomes  
very complicated.

741 Dense cloud all over Kimbe Bay.

746 Kimbe Island (?) a small  
wooded bump, surrounded  
by a broad fringing reef  
with large coral in it,  
already a barrier reef  
with lagoon.

648 Clouds.

751 open water - coast far in  
distance to right, with  
several very small islands.

747 coast still far to right.

748 Clouds, turbulent.

750 coast swinging closer.

757 758 st. a small rock, when  
seen a smaller one with  
a lagoon and barrier  
reef. (C. photos - nd.)

758 A longer island with

two sharp cones, the  
smaller east one smoking,  
west one double peaked.  
(Roloban Island).

8:13

Mainland closer now, but  
too far for observation. The  
further in in clouds.

8:14

Coast swings away to right.  
Crossed interrupted barrier  
reef around Gazelle Pen.  
(thrd.) & coast. Fringing  
reef very muddy.

8:21

Stream to left with sage  
swamps near mouth.

Hilly country densely wooded.  
70. st. on narrow sandy beach  
n. of Londo Pt.

9:23

Inters. becoming very rugged,  
densely wooded - emergent  
trees with thin crowns, light  
green (*Eucalyptus deglupta* ???)  
Rocky stream bed running west.

9:24

High mts with red landslides  
scars, densely wooded to  
summit. A few palms near  
summit. Canopy thin near  
summit but forest appears  
quite tall.

Apparently completely undisturbed,  
slopes very steep,  
ravines deep.

8:26

In clusters over tops of mts. on  
the last range, considerably  
grassy slopes.

8:27 stream angling to left  
some shifting agriculture  
on lower slopes

8:28 moraine on hills from  
shifting agriculture

8:28<sup>1</sup> crossed coast. Irregularly  
fringing and patch reefs.  
Peninsula to left largely  
cultivated, rather flat.

8:31 Ataliklibun Bay  
shores to right cultivated  
Hills, wooded.

8:31 Island in mouth of bay  
in distance, low, wooded.  
To left, large clearings on  
lower slopes, ~~coast~~ coastal  
lowlands cleared, and in  
plantations

8:32 coast.  
Peninsula to it wooded  
but clearings on lower parts,  
upper ridge wooded.  
Grassy clearings along  
coast. Hills with  
shifting agriculture and  
bananas, grass.

8:34 Large coconut plantation  
along coast, many groves  
on hills.  
Much bamboo along  
streams.  
most of hills cleared  
and grassy or in  
bananas, coconuts, or coffee.  
considerable settlement along

shores of shallow bay to  
east of Rabaul.

Rabaul. Shores peak  
to north, irregularly  
wooded. City is on  
flat land around Bay.  
Large volcanos to east,  
partly grassy & green, esp.  
near top. Patches of  
thin woods.

landed on grass strip.

1960 Burnside Arch. New Britain

Sept. 21 - Keravat

Kareba

forest ~~then~~ has been logged  
heavily - ~~seedless~~8 years ago, "treated" 6-7 years  
ago. Now a 95% stand  
of saplings & poles 3-10 cm  
dbh. of *Pometia* ~~+~~ *tomentosa*  
15 m. or so tall. In gullys  
replaced by *P. pinnata*.  
Suppressed seedlings of  
*P. tomentosa* a few inches  
tall abundantDark brown volcanic  
ash soil"Treatment" removal of  
canopy & undergrowth  
later removal of lianasA few *Canarium schliechteri*  
& *C. maynbebinthia*, *Cato-*  
*phyllum*, etc. saplings - also  
*Dracontomelum mangiferum*.  
*Spondias dulcis*, *Canarium*  
*schliechteri* scattered old  
trees, now being killed. 40+ m.  
tallIntolerant *Dracontomelum**Irostia*, *Terminalia* (rare)Intolerant *Catophyllum*, *Canarium*Tolerant *Catophyllum* &  
*Syzygium*, *Gmelina*

About 800 acres of this regeneration

67  
achatina fulica shells - said to  
have been introduced by Japanese.Mussorit ~~ridge~~  
logging areaunlogged forest -  
*Dracontomelum*  
*Pometia pinnata* *tomentosa**Pometia pinnata*  
*tomentosa**Pterocymbium beccariani**Pometia tomentosa**Flacourzia**Pometia tomentosa**Dracontomelum**Elaeocarpus**Neomaniola**Syzygium beccariani*

average ht 120-150'

canopy very open

vines very abundant  
on almost all trunksVery thick intermediate  
story of poles up to 10 cm dbh  
or occasionally 20 cm, 20 m.  
tall~~thick~~ layer to 2 m.of *Zingiberaceae*seedlings of trees, esp. *Pometia*  
*tomentosa* which is the dominant  
tree in top layerRather open tree canopy  
layer 10-100'abundant *Pometia* seedlings mainly

a few inches tall, but some almost all sizes. Mature *Pometia pinnata* about 3-4 to 10 m. in height. Question whether ~~natural~~ natural replacement takes place except in openings, but the occasional developed saplings and poles are not only in openings, but even in well shaded places. However, removal of shade stimulates them a great deal.

The logged but untreated areas have scattered trees, often close enough to be called open forest of uncommercial species, abundantly covered by vines, with thick tangled undergrowth between. about 2000 acres of this.

Then "Pometia ridge" extends about 20 miles ~~west~~ along coast. Ravines support a different vegetation largely dominated by *Pometia pinnata*, on new river deposits, by *Eucalyptus deglupta*.

~~Sept. 20~~ ~~Keasos~~ - Keravat River

10 mi above mouth

41502 *Eucalyptus deglupta*  
emergent in <sup>thin</sup> forest on gravel  
blats close to river

secondary forest 2-6 m  
logged forest 2-6 m

Upper Keravat River  
10 mi from mouth.

*Eucalyptus deglupta*  
forest.

(finish b.o.w. roll several  
nod, ending with seedling.)

Here the river has a broad gravel bed in which the channel frequently shifts during floods, leaving bare gravel or sand flats and bars.

On these the seedlings of *Eucalyptus deglupta* establish themselves very rapidly, practically before any of the weed species. It grows very rapidly, outstripping the weeds and weed-tree seedlings. These reach a height of 200' and diameter at top of buttresses of 5 feet, bark smooth copper color and green, coming off in sheets. (G.W.73)

trunk clear, straight,  
tree 40 m. tall, bark copper color and  
green, stamens white, gall in inflorescence  
common. Specimen from top of tree.

70 1960 New Britain - New Ireland - Manus

41503 *Eucalyptus deglupta*  
common on bare gravel flat, full sun.  
04 *Eucalyptus deglupta*  
common on bare sand bar, full sun

Sept. 27 - Kavieng Air Strip,  
Kavieng, New Ireland  
weeds on coral soil  
around air strip

05 *Lippia nodiflora*  
common  
06 *Phyllanthus*  
occasional  
07 *Spermacoce suffruticosa* Jacq.?  
common

Sept. 27 - Manus Air Strip,  
Is Negros I., Manus,  
Admiralty Is.

weed around air strip  
on compacted coral.

08 *Paspalum fimbriatum*  
occasional  
09 *Fimbristylis cymosa* R.Br.  
abundant  
10 *Spermacoce suffruticosa* Jacq.?  
common  
11 *Torenia*  
common

(#5 chg from 41203-11 to 41503-11)

71

seedlings, large trees  
nearly  
seedlings, large trees  
nearly

stems ascending,  
flowers white

erect, plant purplish,  
flowers white, 4 parted

leaves stiff.

erect, plant purplish,  
flowers white, 4 parted  
prostrate; corolla yellow.

new Britain - information  
from Petzavel

the  
and  
of  
should  
not  
after  
you

Tolai - dominant people  
from around Rabaul  
in punice area.

Baining - ~~some~~ shifting  
villages and population  
decrease. - ~~around sea~~  
begin near Keravat  
southward in mountain  
area. Formerly near  
sea, now pushed back  
into mountains, apparently  
by incursions of Tolai.

Below Eucalyptus belt on  
further the lowland rain forest  
is of Calophyllum, Dillenia,  
Lyriquium, Hornalium, non  
Octomeles, etc.  
with Pometia in pole stage.

On raised coral on south coast  
a mixture of Hornalium, Pometia,  
Calophyllum, Pterocarpus,  
Vitex, Dracontomelum  
no species dominant. Perhaps  
oldest surface in area.

Tolai Harbor Bougainville  
dominance of 2 sp. Calophyllum  
on ridges, some places  
dominated by Pometia, exceptional  
These two types in foothills  
Kosrae

Pometia tomentosa, esp  
with Dracontomelum forms  
a fairly stable forest.

Eucalyptus, Octomeles,  
Casuarina, Albizia sp.  
are pioneers, more or less inter-  
changeable on ash slopes,  
Eucalyptus, Octomeles on gravel flats.  
No Hornalium known from  
Gazelle Pen. in forestry record.

Since 1890 there have been  
explosive eruptions in  
each of major volcanic areas.

On south coast limestone  
Tenacious, about 17 inches of  
soil, sticky clay when  
wet! with limestone exposures  
at surface. - reddish soils,  
much clay.

Low terraces close to coast  
have Calophyllum, Ditsia, etc.  
from N.

Stands dominated by these trees  
are invaded by Pometia pinnata  
and P. tomentosa which may  
form a canopy 100' high.

Eucalyptus eventually develops  
a rotten center, the top is damaged  
(how?) and gradually dies out.  
Never establishes a seedling  
except in new open habitats or  
pure mineral soil. After a

number of stands close to each other, even aged in a stand, different from stand to stand.

Between Rabaul and Keravat is intensively occupied land, much of it in cacao plantation, shaded by Leucaena, etc. some in bananas, sweet potato, etc. Bamboo clump and coconut grove common enough. Away from Rabaul are some patches of grass. Leucaena glauca very common.

Large trees of Canarium, <sup>atropurpureum</sup>, Eugenia, etc. that yield useful fruit are left while clearing forest, now scattered through settled area. These Tolai people have cooperatives which are encouraged by the government to compete with the Chinese. They are very aggressive and intelligent and now occupy the greater part of the volcanic ash or pumice soil area around Rabaul and toward Keravat.

These soils are deep bedded layers of ash and pumice pebbles.

inset  
1941

Left. 27 - Air trip Rabaul - Kavieng - Manus - Wewak - Madang - Lae. DC 3  
Volcanoes around Rabaul  
~~South~~ <sup>form</sup> North Daughter, Matapi

Mother, ~~South~~ North Daughter - Mother has greater part of slopes grassy. Has a blown out crater on side toward air strip. North Daughter slopes mainly grassy, Matapi the lower cone that largely exploded in 1937 is ~~sooty~~ bare but has some grass on outer slopes, extending in places to the top.

The grass on these volcanoes seems a bit too green for Miscanthus, more like Imperata. However, acc. Harrel, it was recently burned, at least on the Mother, so even miscanthus might be green.

Lowest slopes of <sup>Matapi</sup> have bushy patches. These extend irregularly to the top of the South Daughter and almost to top of the Mother.

North Daughter has grassy ridges, otherwise wooded. Lower slopes with some coconuts. Tavui Point abrupt, eight ridges

tend to be grassy, mostly in thickets, lower slopes with thickets and small groves of coconuts.

8:23 Coming rather close to New Ireland, but mist is so thick that no details yet visible.

8:25 Slopes are steep and wooded up to the backbone of the island. Slight coastal lowlands have some cleared land.

8:27 A wider spot on the coast has what appears to be a sago swamp.

8:28 Can see across island. lone green grassy areas in interior, low mountains are woody, irregularly developed fringing reef on s.w. coast.

8:29 Coconut plantation sea point s.e. of Malas. Much of the coastal area here and the small island show shifting agriculture pattern. More grassy areas s.e. Tapian Clouds.

8:33 More coconut plantations along coast.

8:35 Gorior now over interior. low mountains completely forested, but canopy very loose, some palms. To

8:35 Some areas of the mts. seem to be karst.

Forest very mixed. Canopy more complete inland, no evidence of disturbance here, but still the forest seems very irregular.

8:36 <sup>large</sup> Patch of savanna, surrounding areas of low palm swamp. Then large areas of marsh or wet grassland or pandanus & savanna. Some palms.

There are irregular patches showing more and more disturbance. Then areas of cleared land, coconut plantations as coast is approached.

8:39 Coast, broad fringing reef, coastal highway, more coconut plantations, clearings, considerable pandanus. Degraded or secondary forest. Shifting agriculture.

8:40 Kaving in strips. surrounded by a low apparently secondary forest with mostly flat topped trees. Spathodea <sup>recta, Peltata</sup>, <sup>lancea</sup> noted. The aspect here is rather dry. Ornamentals at terminal - Cordia, Malvariscus, Iatropha multifida.

*Hibiscus mutabilis*, *H. hybrida*,  
*Plumeria obtusa*. The strip  
seems very new.

Dark red-brown soil mixed  
with coral fragments.

Achating *fulica* shells  
lying about.

9:23 Took off.

Small coconut plantation  
& gardens around Kaving  
small islands off that  
mostly in coconut plantation.

9:27 rain.

9:32 Tsor Lanning Island -  
rather wide reef flat  
on southeast side. Island  
mostly densely wooded,  
parts cleared and in  
regrowth.

arger parts of Kawulisiai,  
Tsor Bots and next small  
island cleared.

Broad ~~is~~ shelving reef  
in lagoon side.

9:36 New Hannover: lobate  
coast lined with mangrove  
or ~~swamp~~ swamps. Interior a patchy  
mosaic of grass, forest  
some coconut plantation

9:38 Clouds.

9:39 Hole in clouds - same mosaic but  
more forest.

Then coast line with a  
belt of swamps. Interior

solid forest - visibility  
very poor.

Clouds. Then swampy.  
Coast lined by forest.  
Course seems to be following  
north coast.

9:40 9:42 broad swampy belt with  
narrow estuaries, irregular,  
shallow.

Small ~~old~~ grassy clearing  
opposite a small partly  
cleared island.

9:44 9:45 a swamp, a marsh surrounded  
by forest, then Cape Entrance<sup>!!</sup>)  
coast here lined by narrow  
belt of coconut plantation  
around dense forest.

several small islands  
surrounded by wide  
reef flats, with one partly  
cleared, inner one wooded.  
One must be Kung).

Then open blue sea.  
Tingwon Is. ahead and rather  
far to left. Broad reef  
flat on north side, apparently  
very narrow on south. Island  
(3) appear wooded, may be  
coconut plantation. Reef extends  
west for almost the same  
distance as the length  
occupied by islets. Islets  
seem very flat.

10:43 Passed Tingwons.

10:34 Ramburys I. in distance to left. Visibility very poor.

10:39 Horns Is. - reefs broad, no visibility. Pals I. ~~island~~ <sup>island</sup>.

10:37 tiny I. - wooded around at least ~~part~~ herbaceous veg. (clearing?) in center. 2 lagoons or ponds one on s. do. side, one on ~~west~~ <sup>west</sup> end. Pals Island.

10:38 Small lagoon with broad barrier reef on east end. Flat. Almost completely covered by coconut plantation. Scattered trees along s. east. West end has small settlement near boat harbor, mixed large trees (*artocarpus*?? etc.) and coconuts, on about the west 1/5.

10:42 Manus ahead to left. Long white airstrip at Hyane Harbor.

10:44 Los Negros I. partly coconut plantation, partly woods. Reef flat with ~~deep~~ conspicuous surge channels. A number of ponds. Lago swamp. Lwangs forest, Pandanus swamp, mangroves on south end near airstrip. Landed.

10:48 *Casuarina* <sup>sp. sp. sp.</sup> around terminal. *Hibiscus* hybrid, *Coldium*.

11:17 Took off from Manus. ~~Eastern~~ <sup>Eastern</sup> extension of Manus. Coconut plantations, swamp. Along s. e. coast an irregular barrier reef close to coast. Broad mangrove and swamp belt along coast. Extensive but rather patchy looking forest inland. Some shifting agriculture. Small bright green grass-covered hills scattered inland. Irregular hilly country, partly wooded, partly covered by tangled low growth and some apparently grassy patches. Shifting agriculture clearings very sparse.

11:20 Bunai. From here western broad swamp belt. some sago swamp (?), forested hills inland with scattered ~~old~~ new clearings.

11:21 11:22 Parusi - at w. end of large swamp area. Drowned forest area giving very complex reef pattern. Westward, hills come down to shore, densely wooded.

11:26 (mod) (mod) Barrier reef (photos) runs

11:31 wentward from here, changing into an extensive drowned karst with circular and crescent-shaped reefs. (Photos) Coast line now far away to right, very complicated suggests subsidence.

11:34 Reef complex mostly left behind.

11:35 Western southwestern peninsula of Manus in distance.

11:37 Passed tip of Manus. A ~~couple~~ few of linear scraps of reef well out from it, as well as fringing reefs along shore. Peninsula appears wooded but too far away to see clearly. Scattered ~~to~~ scraps of reef that break water. One of them, scarcely breaking water, shows cross striated pattern.

11:41 Passed what appears to be a scrap of barrier reef with a brook ~~in~~ on it and two small ~~small~~ patches. A considerable complex of linear reefs in distance appearing like an incomplete drowned atoll. Possibly the ~~longest~~ <sup>Possibly</sup> ~~longest~~ Two <sup>very</sup> small islets on this. Possibly dabben Is. Too far away to see details.

12:30 Hilly island rather small, in distance to left. Koil? or Viasi? Coast in sight to left far in distance.

12:34 12:36 Vokes I. some distance to right. A somewhat eroded volcanic cone. Ledges wooded, some clearings at base. Visibility poor. Crossed long festoons of whitish foam or bloom, miles long, across course.

12:40-42 12:44 Kairiu I. far ahead and to right. A rather high cone. Mushar, in front of it, is much lower, almost flat. New Guinea coast, steep, forested hills with a low coastal belt that is grassy. Many grassy clearings on lower slopes around Wevah.

12:48 Several low flat peninsulae ~~near~~ Wevah, w. of airstrip. Wevah is on one of them. Degraded forest w. of and back of air strip. Many palms. Grassy low banks and hills immediately back of strip. On seaward side of strip a belt of *Acrostichum aureum*,

1:29 Took off - Wewak.  
 E. of Wewak on coastal strip, sage swamps.  
 Some low secondary thickets, grass. Mountains behind are densely wooded.  
 Lower slopes dissected by deep ravines. A few scattered new clearings, some grassy patches a bit inland some rather extensive. A large fire burning in one grassy hill tops and ridges abundant inland. Complicated low relief, possibly Karst.

1:30 Mosaic becomes predominantly grass, ravine wooded (photos)

1:31 In distance to right large grassy areas. Close to course mostly forest, some grassy areas.

1:32 Small village. Scattered grassy clearing, most of forest appearing undisturbed. Relief still complex, but lower and not so sharp. Grass patches in middle distance.

1:33 Some. Forest along course very dense, apparently many species. Forest more disturbed, some

shifting agriculture along course, but not far inland. No more grass visible inland, but distant visibility becoming poor.

1:40 Village in course, shifting agriculture, large sage swamp. Many small new clearings on low hills back of swamp. Several burning. Mosaic of regrowth.

1:41 We are well inland. Completely forested, but some areas swampy, forest rather disturbed. Not as much relief.

1:42 Area of grass and thickets surrounded by forest, but no village or shifting agriculture seen. Clouds cut off visibility.

1:43 Dense forest, with some irregular grass patches directly on course. Visibility poor.

1:44 Scattered areas of grass and grass with scattered trees + thickets.

1:45 Very large very muddy river. with numerous large black-water elbow like + concentrically arranged

herbaceous vegetation, strips separated by line of trees. all this near river. Clouds bad.

1:52 A large area of sago swamp, with savanna inland between <sup>swamp</sup> it and forest. Small black-water streams, meandering. Many old grassy meanders.

1:52 Mixed savanna and swamp extend some distance. Forest well inland.

1:53 Savanna changes to extensive grassland, from clumps Imperata, without trees. swampy forest below on north side of this. Continues some way, but visibility mostly poor. same arrangement. Country very flat. Extensive savanna, grass brownish green. Extensive forest in distance inland.

1:55 Savanna now very extensive, with swampy patches. Extends into distance inland. May be somewhat marshy, but no water seen.

1:57 Some large patches of forest mixed with savanna inland.

1:59 Small village in savanna.

no cultivation in savanna but many clearings in nearly patches of forest. savanna giving way to forest by expansion of small patches of trees (Pandanus). Village in disturbed forest.

2:00 Extensive flat wooded area some clearing in distance.

2:01 Large muddy meandering river with striking complex of oxbow lakes and marshes.

2:02 Complicated systems of clearing, regrowth, sago swamps (?) apparently following old stream meander systems.

2:03 Some grassy areas, some shifting agriculture, some of forest disturbed, some reasonably undisturbed. Country flat. Visibility poor because of cumulus.

2:04 Small meandering stream. Unbroken forest on flat land, some clearings eastward, more and more as country becomes less flat.

2:05 Mosaic of regrowth and clearings.

Meandering small river

with many ox bows.

2:11 Forest with much regrowth, from shifting agriculture. This continues. Small meandering stream.

2:12 Low hills with much shifting agriculture.

2:13 Small village. Mosaic of clearing, regrowth, forest.

2:14 Small stream crossing course, probably flowing ~~south~~ south.

2:15 Another. Mosaic continues.

Many small streams.

2:16 Slightly larger stream. Then less shifting agriculture.

2:17 Terrain becomes rough (Adelbert Range?). A landslip. A few steep clearings. A few grassy patches on high hills.

2:18 Much clearing locally on hills. Then some rather high mountains. Undisturbed dense forest; very mixed.

2:19 A few new clearings on ridge tops.

2:20 A village on top of mountain, much clearing nearby. Then more densely wooded.

mountain

2:21 Two large villages strung along high ridges. Much shifting agriculture. Some scattered houses.

2:22 Rugged densely wooded mountain.

2:23 Then more clearing and disturbed forest.

2:24 High peaks. Scattered clearings to tops.

2:25 Another village on mountain top, with shifting agriculture. Worked ~~on~~ rugged mountain with a few new and regrown clearings.

2:26 Clearings larger and more common. Then more mts. still very rugged.

2:27 More clearing and regrowth. Bananas abundant.

2:28 Much undisturbed forest also.

2:29 Much erosion and many landslide scars.

2:30 Forest with a few clearings. Mixed meandering river.

2:31 Clearings and regrowth more and more common. (See p. 88)

2:32 Mountains lower but still rugged. Forest largely disturbed.

Occ. Metronylon in forest.

2:33 Shifting cult. predominant, relief low.

coconuts become abundant.  
Patches of Metrosideros.  
Low hills.  
2:36 Coconut plantation,  
with meandering streams.  
2:37 Sanded at Madang.  
(b+w. photos of sago swamps.)  
Around airport a complex  
of thickets, sago swamps,  
cultivated patches.

3:03 Left Madang.

Sparsely low mangrove at end  
strip Madang is built  
on a ~~savanna~~ peninsula  
with a lagoon - very flat.  
Some complicated flat island  
with ponds & lagoons, out  
beyond it, enclosing the bays.  
Low flat coast with  
edging of mangrove  
swamps. Some small flat  
wooded or swampy islets off  
shore.

Large meandering estuary  
just to west crossing  
wide wooded coastal flat.  
Apparently some sago swamps  
west of it.

3:15 West of this, a few patches  
of green grass scattered  
on otherwise wooded  
coastal flat.  
Mountains inland very

3:16 Cloudy  
small stream, meandering  
through a strip of herbaceous  
vegetation. Then a coconut  
plantation, then a large  
stream with braided  
course, also in non-wooded  
slip. Then some light  
green grassy to flat  
land crossed by strips  
of wood. Small stream.  
Then a complex of hills,  
partly grassy, partly  
wooded, some new clearings  
and regrowth.  
3:18  
3:19 Then thickly wooded hills  
with less grass and  
few clearings - a river  
with broad gravel bed,  
braided. Then wooded  
hills with some new  
clearings and regrowth.  
3:20 Thick clouds.  
3:24 holes in clouds - steep rugged  
wooded mountains -  
tremendous relief - Finisterre?  
Dense forest. Steep crests  
that almost scrape plane.  
No low vegetation even on peaks.  
much shifting agriculture.  
Markham - Parma Valley  
in distance on right.  
Village on hill.

3:25  
3:27  
3:28

3.29 Tremendous jumble of high peaks to left. Impressive landslides.

3.30 Flat grassy floor of Markham-Ramu V. to right.

3.31 Much shifting agriculture even on almost vertical slopes.

3.32 Extensive forests, clearing local, becoming more and more general.

3.33 ~~Hills~~ ridges on right, sloping down to valley largely cleared. Village.

3.34 More rugged wooded mountain on right. Frequent landslides. Lower ridges denuded.

3.35 Gravelly river courses running into valley.

3.36 Vast grassy plain on right crossed a river with braided gravelly bed and striking river terraces.

3.37 Then more alluvial plain.

3.38 Lower hills along course mostly burned, almost completely denuded of trees.

3.39 Tremendous alluvial fans emerging from canyon mouths. Vast gravel flats.

3.40 Bottoms of canyons flat and gravelly.

3.41 Wooded mountains, sloping down to valley. Not much

3.42

3.43 Lower slopes and ridge partly cleared.

3.44 Great gravelly river course. Very little water. Many landslides on left.

3.45 Much shifting agriculture on right.

3.46 Tremendous gravel bed in great canyon emerging to join Markham.

3.47 Hills on right almost completely denuded. Very little wood, even in ravines.

3.48 Mosaic of wood and grassy slopes and ridges. Another great gravelly affluent of Markham. Denuded hills. Some ravines still wooded.

3.49 Much burning.

3.50 Hills on right denuded, mt. on left still woody but much shifting agriculture on steep slopes.

3.51 Hills on right look much ~~drier~~ here than back farther. Extensive very rough grassland. Many fires.

Markham plain mostly grassy. Some cult. patches.

some patches of woods. Widely scattered trees.

354 wide braided gravelly stream bed,

355 thin great abandoned U.S. airbase. Covers miles.

356 Marsham river bed. Many large braided channels. Bars between either bare or grassy and bright green.

357 Bare grassy short hills around Lake Wauanu.

358 Wooded terraces, grassy river flats.

359 River bed narrows, broad forested terraces on both sides. Little or no clearing. Much sago in large areas of these terraces.

402 Large clearings & plantations of cassas - ~~not shaded~~. Land at Lae.

405

Sept. 23 - Markham Valley 7 mi. above Lae - cacao plantation of Mr. Henty. Cacao shaded by *Leucaena glauca*. *Leucaena* reaches 4-5 m. Forms rather dense shade. *Mimosa invisa* (the prickly one on Rota) used as cover crop for sweet potatoes. Rolled up and burned when ground is prepared.

1960 New Guinea

Sept. 23 Orosis Valley

Secondary thickets  
along small stream.*Ficus subcordata* Bl.  
tremendous banyan with  
arching trunk-like aerial  
roots. tree 30 m.*Ficus melanocarpa* Bl.  
(incl. *F. hololeuca* Dels.)glabrous above, hairy  
on lower branches*Terminalia* commonMany original forest  
trees left, 30-40 m. tall,  
tangled layer on ground  
3-5 m. tall. Most of  
big trees logged out several  
years ago*Gnetum* - tree 10 m tall  
10-12 cm dbh.In places this wood  
is closed or almost so.  
*Rotan* common, very large.  
Also many other lianas.  
Intermediate tree layers  
very sparse.Shrub layer 1-3 m. tall  
of slender shrubs and  
tree saplingsHerb layer sparse and irregular  
ferns, seedling, etc.

Walking easy.

*Ficus erythrosperma* Miy.  
small tree with reddish  
brown bark6° 40' S  
146° 45' E

Orosis Creek

steep ridge thick  
Pole forest 25-30 m. tall  
spaced 3-5 m.  
irregular intermediate  
layer. Solid ground  
core of *Selaginella*  
about 4-5 m. tall  
above this, where ridge  
is a little less steep, some  
trees are taller and up  
to 4-5 dm dbh.photos of sago swamp  
Marsham Valley,  
above lake

Sept. 28 - Oomsis Creek  
several miles above Lake  
Waranam, Markham Valley  
Drainage  
in secondary thickets with  
scattered old trees

41512 *Ficus melanocarpa* Bl.  
v

(#s chgd from 41212-22  
to 41512-22)

- 3 13 *Euphorbia heterophylla*  
common in open places
- 2 14 *Pipturus albidus*  
common along stream
- 3 15 *Ficus subcordata*
- 3 16 (sub.)  
along stream
- 3 17 *Pohlia*  
common along stream
- 8 18 *Gnetum*  
common locally
- 1 19 *Trentepohlia*  
on hanging root
- 3 20 *Forrestia*  
common along stream
- 2 21 *Octomeles*  
along stream
- 5 22 *Ficus erythrosperma* Miq.  
under story tree

small tree 8 m. tall; figs  
turning yellow (one or two  
ripe ones seen dark red);  
lower foliage hispid,  
that in top of tree glabrous  
(*F. hololampra* Diels)  
bracts pale at base.

shrub 3 m. tall; ripe head  
enlarged, fleshy, white.  
giant banyan with  
arching, flying - buttress - like  
aerial roots, figs yellow.

shrub 1.5 m. tall; fruit immature.  
corollas very pale lavender,  
almost white; stems to  
7 dm. tall.

tree 10 m. tall, 10-12 cm. dbh.  
fruits orange, almost ripe.  
(alcoholic material)

pale green

inflorescences whitish.

very tall tree, (rarely spikes  
and leaves picked up from ground)  
small tree 5 m. tall, with  
reddish brown bark.

100 <sup>1960</sup> <sub>41523</sub> New Guinea  
chq'd from 41223-41235 To 41023 <sub>41035</sub>

2 41523 *Maesa*  
occasional along streams

same - in thick tall disturbed forest.

2 24 *Delaginella*  
very common on forest floor

5 25 (gesner)  
very common in undergrowth

3 26 (anon.)  
occasional in undergrowth

5 27 *Elatostemma*  
common in undergrowth

7 28 (anon.)  
common in undergrowth

same - along stream in secondary forest.

2 29 *Pipturus argenteus?*  
common

2 30 *Laportea*  
common

2 31 *Melochia umbellata*  
occasional

5 32 *Solanum*  
one plant seen

6 33 *Ficus armitii*  
rare

3 34 *Forrestia?*  
very local

Sept. 28 - Markham Valley 2 mi. above Lae  
bamboos  
cultivated

7.M.G. Morobe Dist. 101

shrub 1 m. tall, stems  
green; fruit fleshy, white.

stem ascending to erect.

small shrub

slender erect shrub

1.3 - 2 m. tall.

sub-shrub to 1 m. or more tall,  
tips pendent.

erect shrub ~~1.5~~ 1 m. tall.

small tree or large shrub.

small tree ~~5~~ 5 m. tall,  
does not sting.

shrub 3 m. tall, flowers  
rose pink.

much-branched shrub  
2 m. tall, 2 m. wide; petals  
lobes deep purple, fruit  
scarlet, pendent.

small tree; figs white,  
rose pink.

stems to 1 m. or more long,  
decumbent at base; calyx  
brilliant purple, anil of seed red.

shrub 2 m. tall, flowers cream,  
fruit black (some berries larger).

102

1960 New Guinea

41536 from 41236-43 41536-41543  
Sept. 28 - Oomsis Creek, about  
5 mi. above lake ~~the~~ Wanam  
41536 (cont'd)  
rare in open gravel along streamSept. 29 - 6 mi. out of Lae on Busu River Rd.  
in open cleared land, near  
thickets.2 37 *Ficus variegata*Sept. 29 -  $\frac{8}{2}$  mi. out of Lae,  
Busu River Bumaisong Mission2 38 *Ficus robusta*  
edge of thicket, small stream com. ) ?2 39 *Wedelia biflora* (L.) DC.  
climbing in road side thicketSept. 29 - Between Busu and  
Brafo Rivers, about 10 miles out  
of Lae.in tall *Imperata* grassland  
3 40 *Cycaes circinalis*  
scattered, apparently  
frequently burned, but  
not killed, as trunks  
are somewhat charred.1 41 *Euphorbia*  
occasional✓ 42 *Ipomoea*  
common✓ 43 *Mussaenda*  
common

Morobe Dist.

103

erect, corolla blue.  
throat closed.large spreading tree 12 m. tall  
figs on tubercles on large  
branches, green, filled with  
brown liquid.large tree, 20 m. tall, 3 dm. dbh.,  
leaves up to 3 dm. wide or more,  
sterile.scandent, several m. long;  
heads yellow.

trunk 1 m. tall.

erect.

twining, flowers white, anthers  
ovate, straight.shrub 2 m. tall, enlarged  
calyx lobes white, corolla orange-yellow.

Sept. 29 - Busu River Road.  
Wide strips of Imperata  
grassland alternating  
with wide strips of  
rather altered forest.

near Bumiring Mission  
- tangled thickets to 5-6 m.  
high - Mallotus, etc. with  
scattered large trees  
persisting from forest.

East, between Busu and  
Aupu rivers, open Imperata  
and thickets. Imperata  
burned occasionally.  
Imperata here very dense  
and reaching 2 m. tall.  
Cycas scattered through  
it, about 1-1.5 m. tall.  
Several young male cones  
seen, no female ~~the~~ carpels.

Deep drains across the  
flats, obviously artificial.  
Coarse gravel soil.

No cycads seen west (?)  
of Busu R. Here there are  
trees scattered through  
the grassland. Forest  
strips apparently  
follow ~~the~~ rivers.

Sept. 29 Markham Valley,  
by road.  
Erapp River bed -  
broad gravelly flats  
with some patches  
and tufts of *bachman*  
*spontaneum* and *Imperata*  
a few smaller grasses,  
*Tridax procumbens*  
the most abundant  
plant, *Tricholaena rosea*,  
*Enhalus acoroides*

near ~~the~~ present channel  
*Paspalum quadrifarium* quite  
abundant.

Gravel quite sandy.  
*Panthospermum*,  
*Rhynchosia* common locally.

At foot of hills nearly  
at Old Maramonbe Village,  
the gravel fan is cut  
by a ~~the~~ shallow ravine.  
Here is said to be an old  
elevated reef-limestone  
terrac. searched but  
could find nothing  
but bedded gravel and  
sand. One boulder in  
ravine bed (sample 2)  
may be limestone.  
We did not find the place  
from which it came.  
(ctd. on p. 108)

Sept. 29 - Erapp River Bed,  
41244-54 Marsham Valley, Morobe Dist.  
41644-41554 in open gravelly river  
flat, very sparse vegetation

41544 *Sinapis ciliata*  
rare

2 45 *Tephrosia purpurea*  
locally abundant

2 46 *Rhynchosia minima*  
local

2 47 *Cantharospermum scarabaeoides* (or  
at glaries.) occasional

Sept. 29 Old Nara monke Village,  
foot hills near Erapp River Bridge  
in sparse secondary scrubby  
vegetation on ~~old~~ abandoned  
village site

6 48 *Ficus adenosperma* dd. cones.  
edge of ravine

7 49 *Sida villosa*  
abundant in dry opening

2 50 *Melanolepis multiglandulosa*  
common along ravine

3 51 (sp.) local

4 52 *Abutilon*  
local

11 53 *Mallotus philippinensis*  
local along ravine

2 54 *Macaranga tanarius*  
local along ravine

spreading tuft, <sup>stems</sup> decumbent  
at base  
erect, branched; flowers  
bright purple.

twining in mass; flowers  
yellow.

stems decumbent  
to ascending, tending  
to twine

scrubby spreading  
tree, 5 m. tall,  
bigs green. (form with  
spreading hairs called  
*F. chaetophora* Warb.)

erect, sparsely branched,  
1-1.3 m tall. flowers pale  
yellow, orange in center.

large shrub;

inflorescence pendent.

large shrub or small  
tree

shrub - 3 m. tall;  
flowers dull orange - buff.

large shrub or small tree,  
leaves glaucous beneath; fruit black.

shrub, leaves glaucous  
beneath.

#5 chg  
PMM-7 Sept. 29 - Markham Valley  
41255-7 above lake, at edge of  
H1555-7 grassland

in roadside thicket

41555 *Euphorbia heterophylla*

very common along road.

56 *Ficus infecta* virens Ait.  
(*F. infecta*) det. Corne  
in roadside thicket

Sept. 29 - Bufer River, near lake.  
57 *Ficus glaberrima* Bl. det. Corne  
(brought in by E. J. H. Corne)

(ctd. from p. 105)

This has been the site of a village, recently enough so that rusty galvanized sheet iron is still lying around. Loose thickets cover the area, surrounded by *Imperata*. This recently burned, but sprouting.

The grasslands in this part of Markham Valley are largely *Imperata*, growing to almost 2 m. tall locally, stiff and harsh. On very gravelly areas *Themeda australis* (bangan grass) is dominant, with some other grasses. Locally in the *Imperata* are tufts and

around old or still  
*Ficus infecta*  
abundant

erect.

banyan, sterile.

banyan, figs turning black when ripe.

patches of *Oplurum* and of *Saccharum spontaneum*.

Toward lake this grassland passes rather abruptly into patches of thicket, then into secondary growth, with *Artocarpus altilis* quite common. Many large-leaved secondary species, such as *Macaranga almeidoides*, *Apociss sp.*?, *Ficus robusta*, *Macaranga tanarius*, banyans, bananas and *Heliconia*, *Zingiberaceae*, etc.

Womersley says this is doubtless second growth on old native garden sites.

Sept. 30 - air trip back to  
Port Moresby. (DC-4B)

9:35 south side of Huon Gulf  
largely forested down  
to sea level some  
clearings on flat at  
base of mountains.  
Clearings on lower foothills.  
10:47 Lae Pt. (island) - wooded  
9:47 Large grassy clearing  
btw. Lae Pt. and Salua  
At Salua a big lagooon  
cut off by a bar from the sea.  
Bar wooded.

Valley beyond Salua ~~is~~ -  
flat mostly cleared.  
Small wooded island.  
Along this coast there  
are long narrow beaches  
lining the bay and  
crescent shaped shores  
between points.

9:51 3 small islands, wooded,  
with very narrow fringing  
reefs

9:53 a large island (Lasanga?)  
completely wooded.

Coast mostly wooded  
but small clearings on  
lower slopes here and  
there.

9:54 turned inland.  
Pai-Awa River has  
considerable flat ground

or swamp in its lower valley  
Upper part at foot of  
Moresby has been  
gravelled

9:59  
10:00

Interior on northeastern  
slope is solidly forested -  
several red landslide areas  
larger streams have  
gravelly beds.

Forest on high ridge (Bunya Mts.)  
looks rather scrubby.  
Slopes are marked by gray  
steep forest scars from coastal  
bar.

10:03  
10:06  
10:07  
10:11  
10:20  
10:21

Maria Valley + River Valley  
partially cleared, a  
mosaic of grass, grass  
and forest (Mod.)

Owen Stanley Range largely  
cloud covered. Lower slopes  
densely forested.

Clouds.  
Hole in clouds - forest, but a  
sizeable area of flat brownish  
green grass (perhaps swamp) or alpine  
grassland? hole too small to  
get much idea of topographic relation.  
Then solid clouds again.

Well to right some thinning  
in cloud slope forest.

We then made a sharp turn  
to left. Clouds again.

Coastal islands of  
Mangrove and the

saline flats near coast,  
with a strip of brown  
grassland.

Back of this low hills  
and almost level ground  
with green grass, some  
patches of woods, intricately  
meandering streams,  
oxbow and abandoned channels.  
Woods seem semi-deciduous  
in part (or casuarina or eucalyptus),  
some mixed green and  
light yellow-green.

10.24 Hills with brown Eucalyptus,  
savanna, ravine bottoms  
with dense green forest,  
(One or two ponds), forming  
an intricate mosaic.

10.25 Extensive burned area.  
Many roads winding  
through these hills.

10.25 All savanna, ~~little~~ gallery  
forest. In places trees are  
close enough to be called  
open forest.

10.30 Banded at Port Moresby.  
*Chloris inflata* common  
around waste spots.

Also *Euphorbia prostrata*  
*Potulaca oleracea*.

*Alternanthera* (prickly one)

*Cynodon dactylon*

*Euphorbia pilulifera*

*Gomphrena* sp.

*Cenchrus echinatus*

Port Moresby - Townsville  
left P.M. at 11:38.  
Some mangrove in  
indentation.

On outer coast a broad  
fringing reef with  
some deep pools.

Outside this a broad  
barrier reef ~~extending~~  
a deep bay (Plato).

12:40 Osprey Reef in distance  
Dolphin-like a large  
drowned atoll, open well.

1:13 Bongaree Reef - a perfect  
small drowned atoll with  
narrow, broad reef, no passes,  
shallow lagoon, some  
surf breaking. Color of  
reef flat tan (Plato-tan).

Several small patch reefs  
far in distance to right.

1:36 Many larger patches  
forming 2 or 3 interrupted  
rows. One large patch  
has the form of a drowned  
atoll. Most of them  
like pieces of barrier reef  
no islets. Most patches

curve convex to south  
southeast (two shots, bad)  
One patch on outer edge  
below is very small piece

brown, photos

Many of convex patches.

1:49 ~~1:48~~ 2 small sand bars or  
inner parts6:50 A more angular broken section  
of barrier seemingly  
broken into many small  
segments is the northern  
side of a deep pass.Mainland can be seen  
in distance.1:51 fourth of pass as atoll-like  
complex, evidently completely  
submerged, crossed by  
concentric striations.  
at least in a n. - s. direction.1:54 an irregular patch beneath  
course, also atoll like  
and with radial striations.1:56 A series of at least 5 high  
rugged dry-looking  
islands in middle distance  
to right. Apparently mostly  
brown grass, little woody  
vegetation except on largest.  
Several other very small  
on other side of larger island.  
Fully half of a 3/4 of largest  
island covered by forest or  
scrub. Some of lower  
slopes grassy.2:03 Small island, long axis  
perpendicular to course, sloping  
to both sides, grassy, to right  
in middle distance.small groups of <sup>principal</sup> higher,  
grassy islands, in distance  
to right.Mainland coast in distance  
has long sandy beaches,  
pinkish tan. Mountain  
back of a narrow coastal  
lowland strip.2:07 Beach or sand flat very  
broad near Townsville.  
(low tide). Considerable  
complex of low mangrove  
flat, dark green low  
scrub with lighter  
gray-green trees scattered  
over large areas or forming  
closed stands. - winding  
channels or estuaries.Back from coast a few  
low savanna covered hills  
and great flats with  
open scrub forest, varying  
to closed forest or savanna  
grass dry and brown.  
Landed at Townsville.

Townsville - Brisbane

3:04 left Brisbane (to fly at 16000')

large island opposite  
Townsville similar to  
hills on coastal flat  
area.Large saline area with  
vegetation and areas of

Mangroves along estuaries and winding tidal channels north of Townsville.

Conspicuous beach ridge, bushy. Back of it a bare strip of sand or salty mud, no vegetation.

Complex of salt flats with winding channels lined with low mangroves seaward and landward high rocky hills covered by scrub open forest, the grass dry and brown.

Complex of salt flats and mangroves continues, greatly expanded, now spread inland, running inland along stream, changing to green cultivated fields only a small triangular strip, surrounded by dry grass and savanna.

3.15 a great dry plain with winding channels locally, savanna salt flats, grasslands.

3.17 To left, a great arching sand spit looking north to right at cultivated flat plain, dry savanna inland with the great sandy river bed crossing it toward sea but swinging

3.18

south. Between this and sea a complex of savanna and wood with a belt of <sup>estuaries</sup> lagoons, and bars along coast. Course follows <sup>just to</sup> left of this river till it swings left and splits into several channels, separated by extensive mangrove swamps. Cultivated ground inland replaced by a complex of winding channels, salt flats, <sup>bar</sup> mangrove swamps, etc. with extensive dry savanna inland.

Dry hills farther inland. A road parallels coast in this savanna plain.

3.23 Mangrove complex practically pinches out.

Parallel sandy beach ridges with open scrub <sup>bar</sup>. More small estuaries with mangroves.

Dark brown savanna with some dark green patches of scrub or forest inland; thin gallery wood along stream courses.

3.27 A few small dry hills with thin scrub.

Course following coast some isolated rugged

mountain mass inland.  
otherwise brown savanna.  
sandy stream courses on  
coastal flat.

3:30 savanna assumes a purplish  
or reddish cast. Many  
scattered mountains  
sticking up from plain.  
some very rocky.

Barrier reef so far out  
as to be out of range of  
sight.

3:32 crossed a sandy almost  
dry river, a little cultivation  
along its ~~bank~~ bottom land.  
Otherwise a monotonous  
purple-brown savanna.  
with scattered low hills.

3:35 Plain becomes slightly  
dissected locally. One  
large hill with closed  
forest, dark green, on it.  
Stream courses have  
scarcely any development  
of gallery forest.

3:36 Larger mass of high hills,  
somewhat wooded.

To left a large peninsula  
dry, hilly, bordering to  
left, enclosing a bay  
and some mangrove swamps.

3:38 Densely wooded hill rising  
from savanna.  
Visibility becoming poor.

Very irregular coastline  
to left, dry and hilly, with  
many rugged irregular  
islands. Some of hills  
dark and brush covered.  
Islands bare and tawny.

Many more islands.  
Tonight continuous savanna  
except for cultivation  
along streams.

Whitsunday Passage on  
left, with many high  
islands. No reefs  
around these islands,  
a few sandy beaches in  
concave parts of coasts.

3:46 somewhat hilly country  
inland, small estuary  
with large complex of  
mangrove and salt flats.  
(b+w.) cultivation up the valley.

3:47 Larger complex of estuaries  
(b+w.) and mangrove swamps.  
More islands to right.

The salt flats a bar near  
seem to form a regular belt between  
mangrove and savanna (b+w.)  
A round bowl-shaped  
caldera with a conical  
peak inside it (b+w.)

Many fires in hills.  
Flat cultivated valleys  
separated by low dry ranges  
of hills.  
Crossed a fair sized river.

3:53 A few more islands to left, sandy coast, and a curious "drifting sand" appearance in water.

3:55 Bay estuary - mangrove complex, cultivated valleys and low open-wooded hills inland. scattered higher mountains farther inland.

3:56 Woods on low hills become more dense, closed.

A couple of patches of reef in the far distance to left.

3:57 More estuaries, salt flats and labyrinths of mangroves. Cultivated valleys and wooded hills inland. Fires.

3:58 Flat ground with open forest. meandering streams with gallery forest of mangroves. Wooded hills; some cultivation well inland.

4:00 #22 Scattered small high islands, dry and brown, in distance to left.

4:02 Estuaries, mangroves along coast, large tidal sand flats (b.i.w.) Many scattered small dry islands off shore to left.

Most of coast lined

4:04 with mangroves and small winding estuaries, cultivated valleys behind among wooded dry hills. Irregular flat wooded island near shore, scattered dry higher ones out farther, out to a considerable distance.

4:07 Coast lined by extensive tidal mud flats. More flat wooded islands, with surrounding sand flats.

4:08 Small dry islands well off shore to left.

4:09 Many estuaries and extensive saline flat and mangrove complexes along coast. Course is well outside coastline.

4:10 Large, low, ~~hilly~~ <sup>renovable</sup> islands and with extensive mangrove swamps, ~~so~~ <sup>so</sup> somewhat brooking north, separated for some distance from mainland by a tremendous shallow sandy estuary with braided channels, no vegetation on sand. Some mangrove along coast.

4:11 Many irregular islands far out at sea, visibility poor.

4:13 To right a vast plain with savanna, very narrow gallery along stream, scattered rugged

hills coming up out of the plain.

Visibility very poor.

4:24 crossed a fairly large river. Well inland. Vegetation a mosaic of patches of wood and savanna - patches tending to be angular. Small ponds or reservoirs scattered sparsely over plain. Some cultivation near river.

4:27 Rockhampton.

To northwest a complex of ponds and lakes.

Many fires in hills. Some small dry island in distance to left.

Plains, savanna with narrow gallery woods, to right; some slight relief, low mountain in distance. Meandering streams. Savanna dark brown, but banks of stream lined with bright green.

Large muddy meandering estuary with ~~intertidal~~ tidal channels and mud flats, dendritic branching side channels with mangrove scrub, otherwise extensive salt flats.

Some salt evaporating pans.

red in color.

Hilly country inland. somewhat wooded, savanna on flatter ground.

4:34 Extensive tidal flats with mangrove-lined channels to left.

4:35 Dry wooded hills to right. Some cultivation on flat ground. Dry hills grassy to thinly wooded.

4:37 Complicated lagoon system to left. Large offshore island a very broad bar extending south, separated from peninsula to north by passage. Sound is open to south.

4:41 Wooded hilly country quite complicated, to right. Another lagoon system, also open to south.

4:42 More lagoons, very complex system.

4:44 This seems to be a drowned coast-line complicated by bar formation. Some hilly ground on peninsulas, generally wooded.

4:46 Inland a mosaic of hills and flat ground, hilly wooded, flat, grassy with gallery woods along streams. Very hazy.

4:17 Hilly country to left, behind a straight coastline. Wooded hills and open valleys to right. Mountain ridges parallel to course <sup>far</sup> inland. Course very near coastline. To right rolling wooded country, small open areas. Numerous clearings. Course just inland from straight coastline. Visibility poor because of haze. Many fires. Crossed a fair sized river. Cultivation along it. Then solid forest, then more cultivation. Coast a bit more to left land near coast mostly cultivated. Crossed large winding river. a little cultivation right. Mostly flat forested land to right of course, cultivation to left. A small but deep estuary on left. Then wooded land to coast, little cultivation. Some green cultivated patches to right. Mostly woods. Several estuaries on left mostly wooded country.

5:3 Then coast swings away to left to form a peninsula, mostly cleared and brown, with a hooked cape pointing south. Visibility now to right because of haze. No visibility to left, either. Considerable forest. Lagoons to left, inside coastline. Mosaics of yellow grassland and forest to right. Practically no visibility. Dry grassy <sup>low</sup> hills. 5:15 5:14 5:16 5:17 5:18 5:19 Estuary with mangroves, and a large patch of forest, just north of Brisbane. Over Brisbane.

Oct. 2 - Auto trip north from  
Brisbane  
Bramble Bay  
Avicennia cut back and  
coppicing from stumps. *Acacia*  
Woody Pt.

Laterite beds at sea level  
being cut into by waves.  
Profile (photos) <sup>red</sup> polygonizes  
at top, then a mottled light  
gray and red nodules  
and columnar concretion.  
Under this a mass  
of consolidated concretionary  
iron oxide (sample 3)  
forming an irregular  
and incomplete bed,  
interspersed and irregularly  
interbedded with a white  
kaolin. This seems  
to be rather soft,  
hardening when  
exposed to air. Large  
chunks as well as  
reefs at high tide  
level and intertidally.

At top of beach *Tetragonia*  
*Bromus*, *Phalaris*, *Homchus*,  
*Hypochaeris*, *Baccharis*  
*balansifolia*.

*Hibiscus tiliaceus* planted.  
*Casuarina equisetifolia*,  
*Bambusa*, *Cupaniopsis*

Red Cliff - laterite section  
with ironstone reefs  
extending out to sea  
at least half a mile.

*Hibiscus tiliaceus*, *Callitris*  
*columnaris*, *Eucalyptus robusta*  
*Pinus elliottii* planted  
along roads.

Bush vegetation with  
an open to closed tall  
shrub layer of *Acacia*,  
scattered tall *Eucalyptus*,  
*tereticornis*, ~~go~~ dry grassy  
herb layer. In some areas  
the *Eucalyptus* is close  
enough to form an open  
forest 20-25 m. tall.

And some *Eucalyptus*  
*microcarpa*  
some areas recently burned  
some showing signs of  
earlier burning.

In these open forest areas  
little *Acacia*. Locally  
a shrub layer of young  
*Eucalyptus*.

Seasonally inundated  
areas have a 10-15 m. open or  
semi-closed forest of *Melaleuca*  
*leucodendron*. Slightly  
higher ground with open  
*Eucalyptus* forest of several  
types. Locally ~~it~~ with  
*Xanthorrhoea*.

Burpengary Creek has dense low gallery forest of with "rain forest" species (non eucalypt.).

Sandy flats with *Casuarina torulosa* and some Eucalyptus.

The Eucalyptus seems to stand burning very well after it has passed seedling and small sapling stages.

This area generally sandy or loamy, gently rolling. *Pteridium* locally common on sandy areas. Station Creek.

*Eucalyptus pilularis*

Banana plantation, rather wind-beaten.

Cobboldure River. *Avicennia* and *Ficus macrophylla*.

Lagoon Cr. - sparse mixed gallery forest.

Open Eucalyptus with tall shrub layer of *Leptospermum flavescens*.

Generally open Eucalyptus forest trees uneven in size & height, very mixed mostly *E. intermedia*.

Six Mile Creek - tall Eucalyptus gallery forest, heath on small terraces.

Closed Eucalyptus forest with grass.

Beerburun - plantation of *Pinus elliottii*, scattered very abrupt butter - trachylepis. On side of one called Beerburun is a patch of "rain forest" a moist broad-leaf evergreen forest.

<sup>located by Capt. Cook</sup>  
"Glasshouse" mountains.

Closed Eucalypt forest, recently burned through by ground fire.

Plots of Mt. Tibrogargan, on of glasshouse Mt. (the Old Man) Gentle slopes covered by a <sup>thin</sup> scrub of *Eucalyptus phaerota*, <sup>coastal</sup> *Pistacia lentiscus*, *Eucalyptus trachylepia* about 10' tall. Many interesting plants.

Each of these blocks has a different trachylepia.

Two of them have *Micraira*, dwarf grass with spiral lvs. *Coronowurin*. <sup>Coonoourin</sup>

Small swamps with a tall *Cyperus* and *Melaleuca*. Pineapple Citrus groves. Patches of ragged Eucalyptus forest, open to closed.

Patches of "Wallum" <sup>on</sup> a heath. semi-open Eucalyptus forest.

Wellum Creek.

Rolling over ab <sup>soil</sup> vegetalized soils.

with ragged forest with heath understory.

Flat sandstone or shale. Open forest of fair sized trees, has been protected from fire - has a heavy close shrub layer 7-8 m. tall, replacing the grass or heath layer.

Dense *Eucalyptus* forest with understory of small trees, or locally without it but with ground cover of ferns.

Mooloolah River.

Much ~~less~~ recently cleared land. Ponds.

Near Lippy Cr. locally several sorts of palms in some abundance in forest.

Crossed a small Basalt flow overlying sandstone, weathering to a dark red soil. Formerly covered by rain forest. Now all cleared for agriculture. Commercial ginger culture. *Baccharis halimifolia* very common weed. *Solanum mauritianum* (*S. auroculatum*, *S. carthagenum*) occasional.

Coastal plain, ~~now~~ mostly covered by forest. Dune strip along coast. *Livistona australis*, *australis*

Mooloolah

Coastal strip was covered by small forest - winter cyclone of July 1954 killed practically every tree. Died slowly, probably from driven salt spray.

~~Dense~~ Broad wave-cut bench at about high tide level.

Intensive resort development.

Photos of low bluffs and wave cut platform. Bluffs <sup>(had)</sup> ca were covered by low forest till 1954 cyclone. Now only a few stumps & scattered *Banksia integrifolia* trees.

*Carex* in wetish sand ledge at top of beach, sand spreading down onto top of beach itself.

Estuary of Mooloolah River - lined with *Rhizophora*, sand flats at 1-2 m. above water, lower layers black, semi-consolidated (sample 4). On flats at low tide *Avicennia marina* scattered with abundant seedling. Old trees twisted about 5-6 m. tall. Pelicans and black swans. (photos - had.)

Open *Casuarina* - *Melaleuca* forest on sand flat.

Cotton Tree Beach, mouth of  
Maroochey ~~Beach~~ River  
Row of dunes back of  
beach, about 4 m. high,  
covered by *Casuarina*  
*equisetifolia*, *spinifex*, <sup>in fls</sup>  
*Vitis trifolia* var. *simplicifolia*,  
*Elephantia*, *Hibbertia scandens*,  
*Banksia integrifolia*, <sup>carmentosa</sup>  
*Grevillea drummondii*.  
*Sporodes per-caprae* (b. n.)  
<sup>Ipmoro</sup> (photos)

Upstream on left side  
of Maroochey R. some cleared  
land, some Eucalyptus forest,  
on slopes, moist ~~soil~~  
draws with "wet sclerophyll forest" with *Archontophoenix*, *Livistona australis*,  
etc.

Toward ~~Montville~~ - *Citrus* groves,  
Pineapple patches, sugar cane, etc.  
patches of Eucalyptus forest.  
Near Palmswood abundant  
pineapples.

Toward Montville  
*Citrus* groves, pasture, *Lantana*  
<sup>CAMARA</sup> *camara* thickets.

> Large *Eucalyptus tereticornis*  
on flats.

Hilly sandstone slope  
up to ~~baralt~~ plateau  
mostly cleared, patches  
of thin Eucalyptus forest.  
Forking back, valley seen

to be mostly cleared.

Higher sandstone slopes  
mostly well wooded.

Bananas, papayas.  
Thickets of *Rubus ellipticus*,  
*Lantana camara*, *Mallacanga*  
*tanarius*, etc. on upper  
slopes, fewer trees.

On top, red soil, low  
thickets of *Lantana camara*  
*Rubus* sp. (aff. *argutus*).  
intert. Latean much

dissected *Baccharis halimifolia*,  
*Terraria capensis*, <sup>Budleia</sup>  
*Ligustrum lucidum* planted  
as windbreaks.

- *Acacia* *bidwillii*  
native here, rare now.  
Hills mostly completely  
clear, in *Pennisetum*  
*clandestinum* pasture.  
A few scattered *Acacia*  
in pasture (photos - not,  
b. & w. giving b. & w. result.)

One small patch of rain  
forest that originally covered  
whole area, 2.5 mi from  
Maleny toward Landsborough.  
Very mixed.

In lower slopes thick  
Eucalyptus forest, just  
burned, still smoldering.  
Mostly *Eucalyptus propinqua*.  
Apparently the large trees

resist very well but seedlings & small saplings as well as all other undergrowth killed.

Out of Brisbane on Petrie Road, beyond Petrie, mangifera indica, Callitris, <sup>TAXODIUM</sup> Pinus elliottii, & Taxodium distichum planted along roads.

<sup>BAUHINIA</sup> *Bauhinia variegata*, <sup>ALBIZIA</sup> *albizzia*, *Albizia lebbeck* also common. *Flindersia australis*, <sup>BRACHYCHITON</sup> *Brachychiton acerifolium*. (this in flower bright red, leafless), *Arecastrum romanoffianum*, *Stenocarpus sinuatus*.

The Eucalyptus forests in the lowlands north of Brisbane vary from quite open to closed, are mostly of rather straight trees up to 20 or 25 m. tall, mostly not very large, but ranging up to 3 dm. or even more dbh. A number of species are represented ~~not~~ in ~~any~~ any one stand, and the composition of the stands varies greatly from place to place. Almost all of these forests show obvious signs of fire, and

many of them of very recent fire. It is clear that they are burned through by ground fires most years, killing most of the seedling reproduction and keeping any significant shrub layer from developing. Locally a layer of tall shrubby acacias occurs. Generally there is a grass layer on the ground.

In certain places forests have been protected from fire. Here, depending on the soil, a dense heath-like myrtaceous shrub layer has come in, crowding out the grass. In some areas it may be of tree seedlings <sup>and saplings</sup>, with a ground layer of ferns, or grass.

Mangroves run far up the rivers <sup>as</sup> estuaries as a narrow fringe, widening near the mouth to swamps. Mangroves are said to occur south to Victoria.

Tropical fruits and ornamentals are commonly raised, in spite of temperatures to 28° F.

Along the coast is a belt of dunes of very fine sand. In places these are narrow, merely separating the mangrove swamps, salt meadows, and flats from the sea. Elsewhere, as at Moreton Island, the dunes are enormous. piled, it is said, to a thousand feet, mainly stabilized by vegetation. Where this is destroyed, as by recent development, the sand blows very badly. This area is very rapidly being developed for summer cottages.

#5 chd from 41258-61  
#41561

41558 Oct. 2 - Mooloolabah, 60 miles north of Brisbane

just above beach

41558 *Cragrostis australasica*  
common on narrow sandy beach  
back of top of beach

3 59 *Lobelia*  
abundant in seepy place  
at foot of cliff

1 60 *Dianella*  
rare in low brush at top of cliff

2 61 *Emilia sonchifolia*  
common generally, these from  
excreces in sandstone cliff

This coast is generally of a bedded gray sandstone with coalified fossil wood inclusions. Along the shore this is planed down to a broad somewhat irregular bench up to many yards wide, the outer margin in places raised a meter or so above the general level, and broken into great blocks, some of these undercut and collapsed. This platform lies generally at about high tide level. Back of it are low cliffs, to 5-6 m. high, cut in the sandstone by waves. On top of the sandstone are sandy recent deposits.

2 m.

dense tufts, culms prostrate.

3 m.

~~tufts~~ prostrate with ascending glomerous branches, corollas purple, flowers dull slate blue

6 m.

somewhat fleshy, somewhat glaucous, flowers slightly exerted, purple

5 m.

138

1960 Australia

75 chd from 41862-73 To

41562-41573

41562 (Aug.)

3 common on ledges on sandstone cliff

3 63 *Vellia*  
common at base of sandstone cliff

1 64 *Solanum nigrum* L.  
occasional on sand flat

1 65 (Ruphl.)

2 rare at base of cliff

2 66 *Pimelea*  
common on sandy slopes

2 67 *Lobelia purpurascens*  
very local  
on earth bank at foot of cliff

4 68 *Carex*  
in grass on sand ledge, spreading outwards

Oct. 2 - Mooloolah River,  
just south of Mooloolah, Co  
on sand terrace along river.

2 69 (Xanth.)  
very local

1 { 70 (Xanth.)  
1 { 71 rare

♀

♂

72 ~~Rhipsalis~~ ~~magellanica~~

4 72 *Melaleuca quinquenervia*  
abundant in open forest

4 73 *Exocarpus cupressiformis*  
occasional in open forest

Queensland

139

5 m.

2 m.

mattlike, much branched  
shrub; flowers yellow.

rosettes flat, scapes  
procumbent, flowers bright yellow  
~~petals~~ within, lobes with  
purple stripe without, 3 lobes  
spread fanwise, 2 smaller  
upper ones erect.

erect, stems blackish  
below, with small processes  
on angles; flowers white,  
fruit immature.

caudices with old channels  
stems, new branches  
with white flowers, pinkish  
without.

very prostrate.

rhizomatous, culms  
emerging from sand.

2 m.  
miles north of Brisbane

2-3 m. in dense large clumps.  
edges of leaves sharp.

4-5 inflorescences somewhat  
procumbent, ~~petals~~

tree 18 m. tall, bark papery,  
in layers.

diffusely branched small tree,  
leaves; flowers yellow-green.

140 1960 Australia  
 25 Sept from 41274-82 to 41574-41582  
 same - thicket on river bank  
 41574 *Elaeocarpus*  
 2 common  
 3 75 *Dodonaea viscosa*  
 occasional

26 same - in mangrove swamp on mud flat  
 3 76 *Rhizophora mucronata*? 0 m.  
 locally common  
 4 77 *Aegiceras corniculata*  
 abundant

~~Oct. 2 - Mooboolabah~~  
 2 78 *Zostera*  
 on mud in river, still  
 shallowly submerged at low tide,  
 forming dense beds.

~~Oct. 2~~ Mooboolabah  
 1 79 *Ipomoea per-capitata* <sup>var. *brasilensis*</sup> (L.) <sup>van Dantzig</sup> *volubilis*.  
 common at top of beach

Oct. 2 - Maroochydore, 60 miles  
 (Cotton Tree Beach) <sup>west of Bribie</sup>  
 on sand dunes back of beach  
 2 80 *Oenothera drummondii*  
 locally common

11 81 *Hibbertia sarmentosa*  
 common

Oct. 2 - <sup>new</sup> Montville, 60 miles n. of  
 Rubus  
 on basalt ~~soil~~ plateau, common

Queensland 141

2 m.  
 small tree  
 shrub 3 m. tall.

shrub 2.5 m. tall,  
 with arching aerial roots.  
 Inflorescence is very  
 short and stout for  
*R. mucronata*, but is twice  
 as long as <sup>2 m.</sup> tall; flowers  
 white, petals recurved.

Brisbane

? semi

prostrate, forming  
 loose mats; flowers bright yellow  
 prostrate, forming  
 a loose mat, flowers yellow, petals caducous  
 large arching canes forming  
 dense tangles, flowers white.

Oct. 4 - flight Brisbane-Gladstone  
in DC-3, (left side.)

8:15 Left Brisbane.

east of airstrip, some small watercourses as thickly lined with small mangroves and there are mangrove swamps about the small estuarine bays in the bay. Most of these are also associated with salt flat with low vegetation, a monad. Some scattered mangroves in shallow margin of Moreton Bay, south of a residential area. North of this, instead of a causeway there are extensive mangrove swamps and tidal channels off a large brached creek. Almost uniformly, between the mangroves and the higher, cultivated or Eucalyptus covered land, there is a belt of bare mud flat or salt flat of varying width, with no vegetation (a very low?). This is definitely tidal - partly wet at this time. This is partly gray, but mostly purple (*halimnia* or *haeckl?*), very locally green. The country to the right is generally covered by closed or somewhat open Eucalyptus forest, here rather extensive grassland with a few scattered trees and cultivated patches, mangrove-lined channels, the mangroves very narrow. Clouds.

8:25 Forest, but being cleared in places, some young citrus groves, light gray soil. Clouds.

8:31 <sup>8:31</sup>  
one of  
places?  
Hilly country, largely cleared and grassy, scattered trees, some cultivation on top of a flat topped ridge, with red soil (braltava?) otherwise the soil seems pale or grayish.

8:36 Hilly country, largely cleared and grassy, scattered trees, some cultivation on top of a flat topped ridge, with red soil (braltava?) otherwise the soil seems pale or grayish.

8:38 Flat tops of hills here and there, with red soil, mostly cultivated but one in wooded area - from here large wooded area, less grass.

8:39

8:41 Country largely cleared and in grass, savanna-like, some patches of wood, little cultivation, continues the same but ravines have conspicuous gallery wood. A large patch of forest, mostly quite closed, on course, grass in middle and distance to right.

8:46 Hills in this forest have low, dense, sparse scrub on top.

8:48 The mostly cleared and grassy, some sparse scrub on rolling hills. Generally savanna-like hilly pasture.

8:50

8:51 Forest but too cloudy to see extent - judging from holes, <sup>in clouds</sup> fairly extensive.

8:53 Hills with savanna, sparse scrub on tops, some patches of wood.

8:54 Some scattered cultivation, generally open forest, red soil on tops of low hills.

8:55 5 9:01 Open forest on rolling low hills with dense gallery along streams, savanna in distance to left.

9:00-1:03 same but little of dense gallery forest, marshes <sup>a scrub</sup> along old stream courses.

9:03 cultivated area near meandering river with narrow gallery wood on banks, crossing course at an <sup>acute</sup> angle from left rear. Some patches of ~~wood~~ open forest.

9:04 Fair sized town <sup>Marsborough</sup> on larger river almost paralleling course. Then bending sharply left. Then generally open forest again, with denser gallery along stream courses. Rather frequent roads.

to 9:13 When cloud cover becomes general.

9:14 A few holes show of open forest but with irregular patches of white sand with sparse scrub.

9:15 Several small holes showed open forest.

9:16 Cultivated land, but only a glimpse through a hole in clouds.

9:17 Out over <sup>1000</sup> m.

9:25 Mouth of large estuary with some salt flat, mostly forest behind, some evidence of dune ridge. A spit just north of estuary, broken at tip, enclosing a lagoon along the otherwise straight beach.

9:32 Another estuary with mangrove, spit enclosing a long mangrove swamp along coast north of lagoon and also somewhat south. Then a few parallel beach ridges. Country generally wooded back of beach.

9:34 A large estuary, with fairly extensive mangrove swamp separated from sea by spits. A little clearing, generally woods.

The usual salt flats between mangroves and wood.

2:37 Elongate lagoon with some mangrove, separated from sea by spit except for a narrow mouth, a small estuary, very densely meandering through mangroves to ~~south~~ north end of lagoon, then back into ~~west~~ country. Extensive bloom or floating dust on sea.

9:39 Irregular large areas of savanna in distance, open wood near sea, broad sand dune belt with open to closed wood near sea.

9:41 Generally open forest behind dune belt, but some patches of white sand with scrub, some meadowland, some dense forest in strips of irregular width just back of dunes.

9:43 High wooded hills somewhat inland, generally open forest.

9:44 Hills with open forest. Then a large complicated estuary lined with mangrove and salt flat.

9:45 Tract of almost closed forest, about half that tree dark green, half a blue-gray. Then another estuary ~~with~~ meandering wide mangrove swamp trending north. Dunes between it and beach. Tan colored sandy beach all along this road.

9:47 Another estuary system extensively ramified inland, the closed gray and dark green forest between it and dune belt.

9:49<sup>13</sup>

The estuary system just noted merges with a very extensive complex of mangrove swamps and slightly higher gray and dark green woods and salt flats, these either bare or with sparse herb vegetation, this varying with open water sounds partly cut off from sea by sand islands, these wooded. (Rod. photo of the striking salt sand flats that characteristically separate the mangrove from the higher forest. Possibly this is a function of the large tidal range bed, causing alternate desiccation and flooding in this belt.

9:55

Extensive straw-colored streaks and elongate patches of bloom a floating dirt.

Whole coast here has wide belt of lagomor and mangrove swamps with winding channels separated from sea by rather wide sand islands, or more locally by narrow spits and sand ridges. All rather densely wooded.

9:57

Much bloom streaking sea (photo) small town on point at mouth of estuary or interruption of mangrove belt by a strip of slightly higher ground that comes down to sea between two

9:59

10:00

estuaries. The north one with a very extensive system of tidal channels, salt flats and mangrove swamps. Rather bulky, open forest country along course which is back of wide bar salt flats just south of Gladstone. Back of Gladstone low hills mostly open or semi-open forest, some clearing. Complicated meandering system of estuarine mangrove swamps and salt flats between town and airport.

Eucalyptus trees on hills light yellowish green, mostly.

Gladstone - tide range 14' am. Paulson.

Near dock a sharply dipping series of beds of a very pale light fluffy clay or highly weathered shale with some cherty beds, much shattered and weathered, the whole completely shattered by old fissils, these filled with a black heavy mineral, probably manganese dioxide (sample 6). The chert layers are irregularly brown, stained with iron oxide, but with irregular black masses of manganese dioxide (7). The whole is weathered and brittle to extremely friable.

Oct. 4 - Boat trip - Gladstone to Heron I.

Coast to east rather low and wooded. Facing Island low hilly, with low open forest or scrub forest - some grassy slopes around Gatombo Head. Some low grassy and shrubby dune just beyond it. Then alternating grassy rocky low bluffs and lower sandy stretches, backed by low wooded hills, attenuating out to a long sandy point, becoming more bare distally.

About  $2\frac{1}{2}$  hours out we were in a maze of submerged reefs, so deeply submerged that they showed only as lighter areas in the dark blue water. Crossed it in a few minutes. About 3 hours or a little less out we sighted Marthead I. ahead. Marthead Island is well wooded, with some diversity of vegetation - what appear to be *Casuarina* patches at each end, a lower yellowish forest, possibly *Pisonia*, over most of the rest.

An enormous reef, well exposed and apparently covered by algae, extends from it to the north. Anchorage said to be very poor.

Eshine Island, much smaller, has a very high broad beach, perhaps  $1/5$  a  $1/6$  the total width of the island at low tide. Low scrubby

dark vegetation, somewhat irregular, in the interior.

Much *Sargassum* drifting in water. Several black shearwaters flying ahead of boat, from 1 to 8 gulls following - white headed, light gray above, white beneath, a dark band across the wing just back of tip. red feet. (Silver gull, *Larus novaehollandiae*)

Wistari Reef, exposed at low tide, has around its western margin an abundance of boulders. Several low sandbars in interior, apparently the whole is submerged at low tide. The color of these reefs, when emerged, is a medium slate.

Oct. 5 Heron I.

(Photos, Kod. 10268 & 10269. of *Pisonia* forest, partly leafless, from dune ridge on s.e. side of I.)

Beach rock series in front of custodian's house.  $\frac{1}{2}$  paces of level platform, apparently bevelled, but not clearly so, back of cuesta. Then, dipping strongly seawards a series of cuestas, about  $4\frac{1}{2}$  paces, to where it pinched out near low tide mark.

Temply's  
from  
seaward  
edge of  
interior

Upper slopes show white growth scarifying the whole surface, said by Stephenson

150

1960 Australia

25 chgs. from 41283-96 to 41583-41596

Oct. 5 - Heron Island.

in rather open *Pisonia* forest41583 *Lepturus repens* (Forst. f.) R.Br. var.  
occasional in sandy openings4 ✓ 84 *Ficus opposita* Miq.  
common4 ✓ 85 *Gnaphalium luteo-album* L.  
abundant locally in sandy openings4 ✓ 86 *Wedelia biflora* var. *canescens* (Gaud.) Forb.?  
abundant very locally in openings3 ✓ 87 *Abutilon albovirens* Miq.  
abundant locally in open and semi-open places4 ✓ 88 *Pipturus albidus* argenteus (Forst.) Wedd.  
occasional3 ✓ 89 *Celtis paniculata* (Endl.) Planch.  
common4 ✓ 90 *Stenotaphrum micranthum* (Desv.) Hubb.  
local4 ✓ 91 *Ficus opposita* Miq.  
common1 ✓ 92 *Pisonia grandis* R.Br.  
abundantsame - on dune ridge  
above beach4 ✓ 93 *Tournefortia argentea* L.f.  
very common2 ✓ 94 *Wedelia biflora* var. *canescens* (Gaud.)  
locally common Forb.?2 ✓ 95 *Isaevoia sericea* Vahl  
common4 ✓ 96 *Lophra tormentosa* L.  
rare, one bush seen

Queensland

151

subulatus Forb.

erect tufts with long  
procumbent runners  
low spreading tree or large  
shrub; figs green.sprawling tangled herb  
forming loose mats 1 m. thick; fls. yellow  
erect shrub or suffrutescent  
herb, to 1.5 m. tall; flowers orange  
shrub 2 m. tall, several  
m. broad, branched; styles white  
shrub 2 m. tall (others small  
trees to 5-6 m.), ripe fruit dark blue.small tree 5 m. tall; figs  
immature, but turning purple  
small partially bare tree,  
flowers on bare part.rounded shrub, 2 m.  
tall; leaves gray green,  
fleshy, flowers white.heavy scrambling  
herb, ~~glossy~~ leaves,  
sub-fleshy, flowers yellow.rounded shrub 1 m. tall,  
flowers whitish; fruit white.  
shrub 3-4 m. tall, sterile.

to be made by grazing fish.  
(photos b.w. red.) (several b+w  
photos of general aspect of  
beachrock, also of undercut  
and collapse from back of cuesta.  
on b.w. also.) A coarser marking  
found in <sup>station</sup> potholes at this  
altitude and on dip slopes  
just above low tide mark (photos)

On west side is a narrow  
strip, at most 9 paces wide,  
dipping seaward, replaced  
northward by a narrower  
strip, at most 4 paces wide,  
mostly much narrower,  
much broken up.

Outside here a wide  
sandy reef flat, not varying  
in depth for <sup>about 500 m.</sup> ~~several hundred~~  
~~metres~~ <sup>near shore</sup> with, only a few  
scattered tiny patches  
of dead algae-covered  
coral. These patches  
gradually becoming  
more abundant <sup>and more horizontally</sup> ~~tilt~~ living until  
they cover most of the  
bottom - their tops planeled  
off at a constant level.  
Then for a hundred  
yards or so the pools  
or interstices become  
deeper by about half <sup>most</sup> foot  
forming a sort of ~~pool~~  
but mostly filled

with planes off but  
living coral. Slender like  
brown algae abundant.  
Then a belt of about 50 m  
~~yards~~ where the pools  
are very shallow, and  
great fragments of dead  
coral, ~~are~~ are thrown  
up. Then about 75 m.  
of living reef almost  
perfectly level. At the  
outer edge this drops  
off abruptly into a  
~~the~~ moat several m.  
deep. This is perhaps 15 m.  
wide. Then a sort of dyke  
or ridge, up to almost <sup>9</sup>  
quite the level of the reef,  
of ~~the~~ living coral. Then  
deepwater. The outer  
75 foot shelf is a bit lower  
than the next inner part  
with the piled up fragments  
and the inner to  $\frac{2}{3}$  of it  
is largely a sort of level  
pavement, the living  
organisms mostly in  
crevices and pools. The  
outer part is mostly  
a mass of acropora and  
other corals. Encrusting  
corallines are unrepresented  
but not conspicuous or massive  
(many photos, b.w. + b.d. finished red)

The profile across the reef is as follows - a narrow beach, then sandy bottom without significant variation in depth for about 500 m. patches of coral becoming gradually more abundant and more predominantly of living coral, about half-way out the area of coral patches exceeds that of sand; then the sand bottom becomes somewhat deeper for 100 m. or so, with abundant coral patches, planed off at same level as those landward, mostly living; then about 50 m. of reef with very shallow sand-bottom, compared with that just behind, and with much coral boulder debris, here not much living coral; then about 50 m. of a pavement-like platform, slightly below the level of the boulder-strewn belt, and without debris, much of the structures clearly living, but the pavement not much interrupted; then about 25 m.<sup>60</sup> of a living surface of corals, etc., a deep moat,

then a like-like ridge of living structure. The general color of this is a khaki, from a species of brown alga that covers most of the dead and some of the living surface in abundance. The abundance of soft algae and the scarcity of calcareous reds is in sharp contrast to the Marshall island reefs. See the algal belt of the Marshall is lacking except on the belt just outside the boulder zone.

The boulders on this side are generally small, not more than 5 dm. or less in greatest diameter, generally, and tend to be flat or irregularly flattened.

156 1960 Australia  
 41597 <sup>#5</sup> *Scaevola sericea* Vahl  
 common  
 1 ✓ 98 *Euphorbia chutioides* (Fahl. f.) C. A. Gaert.  
 rare  
 1 ✓ 99 *Euphorbia <sup>ramosissima</sup> characias* (L.) Biss.  
 rare on outer slope of  
 1 ✓ 100 *Calsile edentula* (Bigel.) Hoch.  
 common on outer slopes  
 4 ✓ 01 *Casuarina equisetifolia*  
 common <sup>var. incana</sup> Benth.

2 ✓ 02 *Pandanus*  
 common

1 ✓ 03 same - in Pisonia forest  
*Pisonia grandis* R. Br.  
 abundant, dominant

same - around buildings  
 and disturbed places

4 ✓ 04 *Lesqumia altissimum* <sup>orientale</sup> L.  
 common locally

4 ✓ 05 *Lepidium virginicum* L.  
 common locally

4 ✓ 06 *Amaranthus viridis* L.  
 common locally

2 ✓ 07 *Solanum nigrum* L.  
 rare

Queensland 157  
 rounded bush 2 m. tall;  
 flowers whitish.

prostrate, half buried  
 by sand, flower green.  
 sprawling, decumbent  
 branched herbs,  
 petals purple.  
 tree 6 m tall, branchlets  
 drooping (comes from ground),  
 branched, ratlike  
 pyramidal tree, its  
 bark rather fleshy  
 and easily bruised and  
 scratched; fruit deep  
 orange, cluster  
 subglobose, 14 x 15, 15 x 16 cm,  
 pendent.

tree 6 m. tall, trunk  
 very thick; sterile.

petals yellow.

petals plant large,  
 branched from base, petals  
 minute white  
 spots pinnule brownish.

stems green, with minute  
 processes; flowers white.

158

#1960 australis

✓ 1308

*Tribulus cistoides* L.  
occasional

✓ 109

*Boerhaavia repens* L.  
occasional

✓ 110

*Digitaria ciliaris* (Retz.) Koen.?  
occasionalsame - ~~say~~ flats at top  
of beach on north side.

✓ 111

*Casuarina filiformis* L.  
common on various shrubs

✓ 112

*Cordia subcordata* Lam.  
common

✓ 113

*Hyparrhenia virginicus* L.  
locally common

✓ 114

*Scutellaria sericea* Vahl  
common

Ost. 6 - Heron Island -

in open *Pisonia* forest

✓ 115

*Celtis paniculata*  
common

✓ 116

*Cornimiphora* <sup>coriaria</sup> *aduncus* (L.) Hem.  
rare and local, small colony  
of several plants

✓ 117

*Pisonia grandis* R. Br.  
very common

✓ 118

*Ficus opposita* Miq.  
common

✓ 119

*Pisonia grandis* R. Br.  
very common

Queensland

159

petals prostrate; petals  
yellow, 1 cm. long.  
prostrate from a thick  
tap root, forming a  
mat; leaves white  
beneath, green above;  
flowers white.  
tufts spreading

vine almost dead.

small rounded tree,  
4 m. tall; fruit dry.  
forming loose mat or  
rod.shrub 2-3 m. tall,  
rounded; flowers purple.

tree 6-7 m. tall, fruit blue.

scrambling, divaricately  
branched, slightly woody,  
10 m. long; flowers white.rounded partly bare  
tree 1 m. tall; flowers pale greenish.  
small tree, only young leaves  
pale purplish green, becoming some-  
what orange, falling easily at this stage.  
small tree, rarely bare;  
flowers pale green.

160

1960 Australia

✓41320 ~~abutilon~~ *Abutilon abutiloides* Miq.  
4 abundant, forming  
shrub layer

Oct. 6 - Heron Island  
in open mixed scrub forest on sand  
southeast end

✓ 21 *Tribulus cistoides* L.  
rare

✓ 22 *Scaevola sericea* L.  
common

4 ✓ 23 *Suaeda maritima* L.  
locally abundant

✓ 24 *Ficus opposita* Miq.  
common

✓ 25 *Pandanus tectorius* Park.  
~~common~~ rare

✓ 26 *Pandanus tectorius* Park. (= *P. pedunculatus*  
R. Br.)  
common

✓ 27 *Euphorbia heterophylla* (Forst. f.) C. A. Gard.  
locally common on open sand

sand - "dune ridge on southeast corner  
4 ✓ 28 *Scaevola sericea* Vald (pubescent form)  
~~locally common~~, one colony

5 ✓ 29 *Euphorbia characias*?  
common *ramosissima* H. & A.?

✓ 30 *Spinifex hirsutus*  
very local

✓ 31 *Stenotaphrum micranthum* (Desv.) Hubb.  
local

✓ 32 *Thunaea involuta*  
common

Greenland

161

plant 1 m. tall;  
flowers orange

prostrate, extensive  
root system, flower  
bright yellow, 28 mm. across.  
shrub 1 m. tall  
- flowers whitish.  
- shrub 2 m. tall,  
- flowers yellow  
- shrub ~~2~~ 2 m. tall,  
- leafless, figs turning purple.  
tree 1 m. tall; fruits from  
ground beneath, leaves also.  
tree 6 m. tall; fruits from  
ground beneath.  
- stems green, varying  
to almost leafless.

shrub 2 m. tall, flower  
purple.

prostrate, flower green.

mat forming; sterile.

Oct. 5 - Heron Island

Elongated east and west, the south side bordered by a dune ridge 4-5 m. high, with *Tournefortia*, *Acacia*, *Pandanus*, *Casuarina*, etc.

The flat interior covered by a *Pisonia* forest, this rather open, low, but of trees with large trunks, partially leafless now due to lack of rain during the last few months.

*Anous tenuirostris* nesting abundantly in *Pisonia*, but apparently a slightly different form than in Marshalls, with grayish cast to neck and tail, and perhaps a longer beak. Nests compact, of *Pisonia* leaves, which they were gathering.

No raw humus on ground and no phosphate rocks. The ground is honey-combed with shearwater burrows and covered by mounds of sand from them. The sand is very pale, scarcely discolored. Dry and drying leaves are abundant on the ground.

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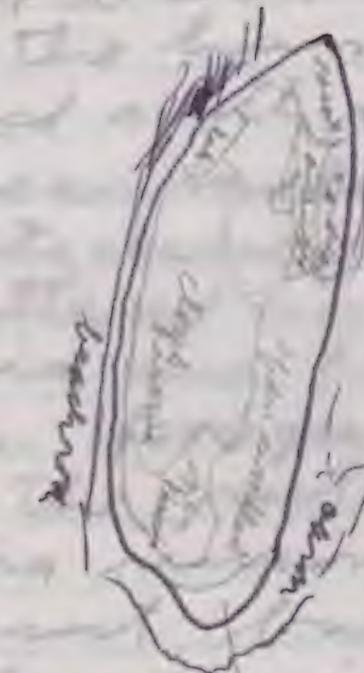
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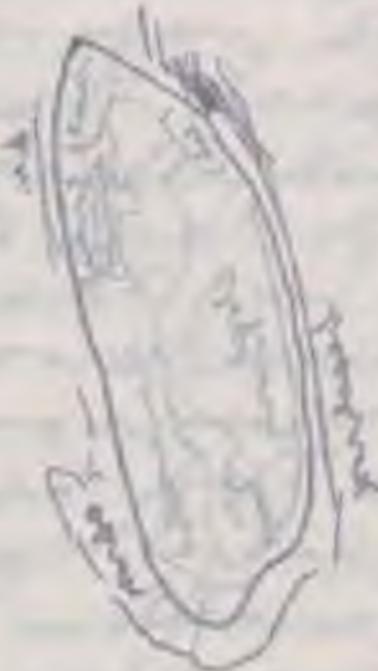
PACIFIC SCIENCE BOARD

207. *in Her blood*  
water out west,  
with no border  
line only 4-5 mi.  
out from  
Collegio, Panama,  
Cerro de la  
Roca, etc.

Two feet in diameter and  
by a Pisonia root. The  
rather open, low, and of  
trees with large trunks  
practically leafless in  
most of lack of rain during  
last few months.  
Worst month  
being about  
now, but appears  
slightly drier than  
in the hills, with  
yellow cast to much and  
and perhaps long been  
into compact of loose  
soil, which they were  
gathering.

No new burns or growth  
and no phosphatic rock.  
The ground is honey-combed  
with streamwater burrows  
and covered by a mould  
of soil from them. The  
soil is very pale  
readily dissolved.  
No seedling leaves  
are abundant on the ground.





as well as stains of guano under the trees where the nests are. sometime a slight caking from guano and sand, not washed out by recent rains, as these have been now. Apparently the constant stirring up by the burrowing has kept the humus well mixed with lime-sand, so no accumulation nor acidity develops.

Scattered among the *Pisonia* are *Ficus* and *Celtis*. Some grass and much *Euphorbia heterophylla*. On the north side <sup>in ground</sup> *Pisonia* uncommon east of resort, but *cordis* and *casuarina*, <sup>some</sup> *farm*, with *Tournefortia*, an open scrub-forest.

Oct. 1. ~~For~~ *Pisonia* forest opens up, eastward.

One small area, of only a few sq. m. has a layer of raw humus about 10 cm thick, and a slightly caked layer 5-6 cm. thick, mixed humus and sand, over a brownish sand. (Samples 7, 8, 9.) Stained

with guano from  
noddy nests overhead.

Apparently a place that  
by chance, escaped  
turning over by shearwater

Understory in open  
parts of *Pisonia* forest  
generally a thin to  
moderately dense  
layer 1-2 m. tall of  
*Abutilon* replaced locally  
by a stand 1-1.5 m. tall  
of *Euphorbia cyathophora*.

In very few places is the Pisonia thick enough to produce a really open condition beneath it.

Noddie very common, at least a few nests in most *Acacia* trees and a few *Celtis*, etc.

(several photos b+w + col.

of open *Pinus* forest with  
abundant shrub layer.

—mounds produced by streamwater

Toward east end the forest

opens up, becomes dominated by landscapes with much

by sandbars were many  
*Celtis occidentalis*, some *Tilia*

contig' patches of fumiano,

Leucosia, Wedelia. grass  
and *Carex*. Prof. Septem

much *Cassytha*.  
*Pandanus* variable

<i>geopelia humeralis</i>	Birds Ruddy turnstone Wandering tattler Blue faced Boobies Crested terns Doves (Bar-headed dove) Silver White eye <i>Zosterops</i> <i>lateralis</i>	1 4-5 very common 2+2 3+2+2+2+1 4+3 1
<i>Haliaeetus leucocephalus</i>	Br. Tern Osprey <sup>white breasted</sup> no eagle	godwit (flock) prob. bar-tailed
	Planted species	
	<i>hamazona raman</i>	
	<i>Cucurbita</i> sp.	
	<i>Tropaeolum majus</i>	
	<i>Delonix regia</i>	
	<i>Carica papaya</i>	
	<i>Macadamia ternifolia</i> (pot)	
	<i>Jasoranda</i> (pot)	
	<i>Erythrina</i> (pot)	
	<i>Ficus</i> sp. (pot)	
	<i>Cupressus sempervirens</i> ? (pot)	
	<i>Cassia</i> sp.? (pot)	
	<i>Solanum lyngbergianum</i>	
	<i>Pinus</i> sp. (yellow seedling)	
	<i>Euphorbia pulcherrima</i> (pot)	
	<i>Mirabilis jalapa</i>	
	<i>Monstera deliciosa</i> (pot)	
	<i>Codiaeum variegatum</i> (pot)	
	<i>Begonia</i> sp. (pot)	
	<i>Zelkova pendula</i> (pot)	
	<i>Scindapsus aureus</i> (pot)	
	<i>Calystegia</i> sp. (pot)	
	<i>Sansevieria roxburghii</i> (pot)	

41523 Oct. 6 - Heron Island  
around buildings, and disturbed places

41333 *Apium leptophyllum* (Pers.) F.v. M.  
very local

1 ✓ 34 *Portulaca oleracea* L.  
very local (formerly very common  
but weeded out)

4 ✓ 35 *Cuphorbia cyathophora* Muell.  
abundant generally

2 ✓ 36 *Cenchrus echinatus* L.  
very local.

4 ✓ 37 *Sonchus oleraceus* L.  
occasional

2 ✓ 38 *Crotopus didymus* (L.) J. E. Smith  
very local

4 ✓ 39 *Conyza bonariensis* (L.) Cronq.  
common

4 ✓ 40 *Eleusine indica* (L.) Gaertn.  
common locally

~~✓ 41~~

same - planted

✓ 41

*Rheum?* *Rumex vesicarius* L.

✓ 42

*Limonium banduei* (Lestib.) O. Kze

same - open woodland  
in east central part.

2 ✓ 43 *Lepturus apern (Forst.) A. Br.* ?  
~~but~~ ~~stoloniferous~~ common  
but mostly dead

✓ seeds with raised stellulae  
nets show great variation in size)

prostrate, purplish brown,  
flowers yellow.

herb 1.5 m. tall, bracts  
with red spot at base.

erect, glaucous; flowers yellow.

prostrate.

culms spreading.

— sepals pale green, turning reddish  
rosette with several  
ascending scapes.

*Van. subulatus* Fosb.

branches stoloniferous.  
~~glume~~ (spikelets in pairs?)

Planted (cl.)  
*Euphorbia tirucalli*  
*Kalanchoe*? (pot)  
*Salvia splendens* (pot)  
*Poly podium punctatum* (pot)  
*Mandina domesticus* (pot)  
*Maranta arundinacea*? (pot)  
*Hosta*? (pot)  
*Nerium indicum*  
*Cocos nucifera* (seedling)  
*Plumeria rubra*  
*Petunia*

On east end the reef stretches to the horizon (5 miles) and except for a sandy and gravelly strip a few yards wide at the bottom of the beach the coral patches cover most of the flat for at least 200 m. and in north east part, much more out. Some clear green sand in distance to south east.

2 low islets visible to north & northeast.

In front of n. s. beach a broad sand apron (b. w. photos + ripple marks) + weathered beach rock  
 A very low dune ridge along north side. Patch of Spinifex.

North side - considerable area dominated by *Cordia*, with some *Pisonia* - strip back of beach undergrowth of *abutilon* *Wedelia*, *Euphorbia cyathophora*.

Then an open area of sand much dug up by turtles, with scattered small *Casuarina*, *Ficus*, *Sciaevola*, *Pandanus*, *Tournefortia* and with *Calile Wedelia*, and a small patch of *Commiphora*, ~~and~~ some tufts of *Lepturus* (mostly dead) on ground (if ~~if~~ <sup>if</sup> fibrosus) (photos of ref.)

Eastward undergrowth gets thicker, more predominantly of *Wedelia*, *Pandanus* dominant in tree layer. (photos ext. & how)

On east end *Sciaevola* and ~~Tournefortia~~ very common forming a discontinuous scrub 2-2.5 m. high among the *Pandanus* and on the extreme end *Pandanus* drops out giving way to *Casuarina*. A patch of *Lauriana* in interior of east end. (photos b. w.)

N. s. beach lined with a row of low *Casuarina*. (photos b. w. + kod.)

Reef on west side is about 25 m. wide, generally more living than on north side. Coral patches dominate all the way out. generally planed to about exactly the low-tide level of today. The sandy patches are about 45 cm. below this level for about 15 m.

Then they get deeper. The reef gets more live and more dominated by Acropas.

The level of the Acropas rises slightly about 60 m. back of the reef front, ~~but~~ and the sand level also rises. Sand patches become less abundant then the 30 m. back of the edge slopes very gradually down toward the edges, an almost solid surface of Acropas, with a few pools 1 m. or so deep.

W edge is abrupt. Through several ridges as dimly visible beyond in the water.

The outer lower shelf is almost entirely of acropas sp. a flat topped species with numerous conical points out of a heavy fused base.

These points get broken off and the fused bases form a pavement substantial enough to walk on. Apparently the old colonies are smoothed by abrasion. (photos)

3 gannets? with black back and white beneath on old wreck, flew away before they could be observed well.

Beachrock extends ~~as~~ along the entire south coast and a strip along perhaps half the north coast, entirely between tides.

Manning, caretaker at Fern I. Laboratory, says that on Wreck Island, to the north, a boring was put down by an oil company last year which reached bedrock at just over 1200 feet.

He also said that Lady Elliott Island had been completely denuded some years back and that phosphate had been exploited.

He says that on Masthead Island in Pisonia forest trees are abundant and shearwaters either absent or not numerous.

Oct. 5 - Heron Island  
on fringing reef north of island

41344 *Cladophora*  
2 on outer margin

2 45 (brown alga)  
abundant on rocks and coral

2 46 *Cladophora*  
on dead coral on reef flat

2 47 *Liaconia*  
on dead coral on reef flat

2 48 *Halimeda stuposa* stuposa  
in sandy pools on reef flat

2 49 *Caulerpa*  
on dead coral on reef flat

2 50 *Caulerpa*  
on dead coral on reef flat

2 51 *Lavencia*?  
abundant on dead coral on reef flat

1 52 *Trubinaria*?  
rare on dead coral on reef flat

2 53 *Halimeda*  
common on reef flat

2 54 *Caulerpa*  
creeping on sand of reef flat,  
rhizome ~~shallows~~  
on surface of sand

Oct. 7 - Gladstone  
in salt flat with  
small mangrove

4 55 *Rhizophora*  
rare

2 56 *Avicennia*  
abundant along tidal channel

(cont. p. 180)

globose bright green  
colonies.  
no inflated; bluish color.  
bright green balls.

erect, stipe buried in sand.

reddish brown to dull brown.

brown, stiffish.

dark green

green

green, prostrate, elongate.

shrub 1.3 m. tall.

shrub 2 m. tall; leaves white  
beneath (varying to broader on other  
bushes); flowers orange.

Aug. 7 - Erskine Island, from north - broad sandy beach, but clearly only about  $1/10$  the width of the island at high tide. The vegetation is low but more or less continuous, appears to be mostly *Tournefortia* except for a patch of what possibly may be low *Pisonia* just west of the center. The eastern and extreme western parts seem to be somewhat open. A large area of sand is exposed at low tide.

Masthead Island - patches of *Casuarina* at northeast and southwest sides. *Casuarina* scattered along the northeast side. Otherwise the forest which covers the island seems to be *Pisonia*, largely leafless in this dry season. The *Pisonia* and *Casuarina* forests appear quite dense.

Northeast of Masthead island an area of sea covered by a thin brownish scum & and quantities of a large *halgassum* species. It is not clear what the scum is, but it seems to be associated with

the *halgassum*. This is perhaps the "bloom" observed from the air between Brisbane and Gladstone.

Entering passage to Gladstone Harbor - on left long peninsula, with low partly grass covered, partly bare dunes with a very small settlement. On right a small islet, being cut away by waves - appears to be a weakly consolidated dune, cross-bedded, but brown below & with ironstone, gray with some small green.

On right near base of peninsula is some low dense forest. Then loose dunes behind it, higher than forest. Then the main part of the island covered by open wood, varying to closed, low stature, on low rock with partly covered by dune sand. Gray-green to ~~dark~~ olive drab aspect. Uneven. A few small houses, mostly on a wooded sand peninsula.

Other side of harbor hilly, covered by open forest.

Past the sand peninsula the island becomes low-hilly, open wooded. A few small mangroves in shallow water in front of shore.

On higher hills to right of harbor

the <sup>open</sup> forest has an appearance of being planted in rows up and down the hillside as though reforestation had been carried out, or as though it were an orchard. Result of tilted bedding planes of rock?? Apparently so. Many ~~star~~ gallies on wave cut cliff suggesting same thing. Receding shore of Facing Island, on left, low and wooded.

Inner passage, between two islands (one on right maybe peninsula) that are low hilly, one on right with open forest and *Xanthorrhoea* above cliffs, that on left with more closed, but still rather open forest. A thin line of small mangroves in water in front of beach.

On right very small mangroves on seaward side of peninsula, a narrow mangrove swamp all along the inner side.

The grass on all these hills between the trees is dry and brown.

Inner point of island on left is a long low sand spit, first attenuating to grassland, then grass to sand distally, lined with narrow rows of mangroves on both sides.

Another island, ~~as peninsula~~, on right, surrounded on this side by low wave cut bluffs, these ~~sparsely~~ loosely wooded. Top a grassy knoll with a few scattered trees, including several small palms.

Then another low knoll-like island ~~as a~~ peninsula with open woods and a little grass, and a wide mangrove swamp on the right side.

On left, the hilly island is prolonged toward Gladstone into a sort of spit, probably of high partly eroded dunes, but possibly of rock, thinly wooded - this connected with island by a low isthmus of sand with a small hill in middle.

On right still another low hilly semi-wooded rocky island. Bluffs are partly bare. A grassy <sup>with yellow</sup> sand slope facing Gladstone.

End of  
Nov 19  
1944

## Oct. 7 - Gladstone

Extending inland from a rather extensive mangrove swamp back of the harbor is a small tidal channel, lined with *Avicennia* about 1-3 m. tall. Around these are mud flats with a thin growth of *Suaeda*, and in parts, *Sporobolus virginicus* & very few small *Cerisops* and *Chrysophyllum* with the *Avicennia*. Large castings of mud common in the *Suaeda* and *Sporobolus* flats. Toward the hill on which most of Gladstone is built are narrow flats completely covered by a sod of *Sporobolus*. In the other direction are wide mud flats completely bare of vegetation, cracking slightly as the surface begins to dry. This mud is generally wet but finely sandy at least on top and not very sticky. Locally there is fine gravel. The whole supports a meagre weight, and over the mud around the mangroves.

## Gladstone airport

Open *Eucalyptus* forest, tree ~~row~~ of all size classes up to 20 m. tall, 4 dm dbh. under story of *Xanthorrhoea* up to 4 m. tall.

Young *Acacia* and other shrubs to 2 m. tall. Grass has been very recently burned, apparently killing many of the young *Acacia* and other other small shrubs, not injuring trees or shrubs above 1 m. height nor the grass trees.

This forest has three definite layers - the tall *Eucalyptus*, the grass trees, and the herbs and ~~the~~ small shrub layer, ~~ma~~ des tall. There seems to be a gradation in size of the *Eucalyptus*, but a preponderance at between 15 & 21 m. tall. The *Xanthorrhoea* layer is sparse. (photos - ed.)

Judging by the view from the air the grass-tree layer is not at all general.

180

1960 australis

41357

*Cenopsis*

rare

1 57

*Sporobolus virginicus* L.  
abundant

1 59

*Fimbristylis*  
common around edges of

2 60

*Centaurium*  
common around edges ofsame - ~~edges~~ of sidewalk

3 61

*Emilia sonchifolia* (L.) DC.  
common

Oct. 7 Gladstone airport

62 *Coclospermum reticulatum*,  
occasional in open Eucalyptus forest

Oct. 9. - near Canberra, A.C.T.

on grassland that has not  
been burned or grazed in  
recent years63 *Cheilanthes tenipolia*

common.

64 *Asperula conferta*?

common

Queensland

181

shrub 1.5 m. tall

forming a continuous sod;  
~~scapes~~ culms and scape ends  
in small tufts.

erect, glaucous, flower pink.

in tree.

somewhat glaucous and  
fleshy; flowers rose pink,  
only slightly exerted.

shrub 1.5 m. tall.

erect from buried rhizome,  
flowers white.

Od. 7 - flight Gladstone-Brisbane, in folkser friendship, rt. side. left at 4:37.

Mangrove swamps are mostly lined by an open belt of salt flats between mangrove and higher ground. This can have a sparse *Ischaemum* (?) layer locally or not. It seems to be drying on the side toward higher ground.

Dozens of fires in the hills in the distance to right, a few close. Mts. in distance obscured by smoke. Much ground along course is black and burned over.

Course is farther inland than when I came. The hills, generally, are covered by open forest.

Changes to grass except near river. Visibility poor.

Alternating areas of grass and forest.

River systems meandering, even away from proximity to sea.

Forest predominates, but with some cultivation.

Flat valley, river terrace, cultivated, apparently sugarcane. Descending toward another river with much cultivated land, certainly sugar cane. Fairly large town.

4:51

4:54

4:58

5:00

5:05

Loc. here seems to be very sandy, gray to white, locally red spots. Bundaberg.

Beyond here a varied forest, with areas of low scrub or scrub forest, dark yellowish green, outlined by open forest, a scrub showing white sand, apparently following water courses or differences in level. Visibility very poor.

Even a general mosaic of patches of forest of different shades of grayness due to sandy background (?) and greenness due to tree crown.

This is on a broad plain in which rivers are slightly incised.

Then the forest becomes denser and more uniformly green.

Course following railroad, through vast forest on flat ground, almost closed forest but not quite except locally.

Descending at Maryborough.

Took off.

The country southward is largely wooded, some areas of cultivation. Dark red soil.

Fires. Smoke causes poor visibility.

Oct. 8 - air trip Brisbane - Sydney  
(Electro - alt. side)

1:13 off ground (25,000' alt.)  
extensive mangrove swamps, principally *Avicennia*, around Brisbane River, salt flats not very conspicuous, largely purple from *Ischaemum* a pale green from *Ipomoea*. Mangrove gallery along most tidal stream. Many patches of sparse Eucalyptus forest around Brisbane, some appear to have been burned, several are actually burning, smoke causes poor visibility.

1:19  
1:20 - 1:22 Primary savanna and <sup>and</sup> grassland. Primarily savanna with some areas, especially billy, ones, with open forest; very narrow gallery, or none, along streams. a little cultivation on stream terraces, and flat ground generally, mostly rather hilly country. Fires common, poor visibility from smoke.

1:23 A sharp cone-shaped mountain, slopes wooded, peak rather bare, some open country surrounding it.

1:29 Rough, densely wooded mountainous area.

1:30 - 1:35 Savanna with rather sparsely wooded hills, narrow but conspicuous gallery along streams. cultivation in flat valley bottom.

1:35 Wooded area but smoke so thick visibility poor. Rough mountains with open to mostly dense forest, some lower slopes and valley bottoms cleared. Several

fires. A river with a sandy bed and little water winding through these mountains. mosaic of woods and open areas, pasture and patches of open or closed forest.

1:44  
1:46 Change to predominantly open country, pastures, patches of open forest or scattered trees, some cultivation, streams without gallery, landscape generally drab.

1:53 A few green patches and a general tendency to greenness in the drab pasture. Trees become more abundant, scattered.

1:56  
1:53  
1:57 begins to be rocky.

1:59 A very rocky mountain mass, scattered trees, still, very locally close enough to be open forest.

1:60 Rocky hills common, open wooded, grassy valleys between them. Clouds - no visibility.

2:03  
2:09 Gap in clouds, green grassy hilly landscape, tops of hills wooded, scattering of trees on slopes.

2:12 Green, very hilly, scattered trees and patches of wood plentiful.

2:15 Series of roughly parallel ridges, rather thickly wooded with grassy valleys between them, crossing the course at an angle to left.

7:16 Open grassy country with cultivation on flat ground in valley bottoms. A few patches of open woods. Several small towns.

7:17 All grassland with small patches of scattered trees, no cultivation.

7:20 Small open cut coal mines. generally open grassy country, scattered trees locally.

Clouds.

7:26 Complex pattern of wooded hills with side ravines perpendicular to ridge axes, flat narrow green valley bottom. Probably karst.

7:28 The grassy valleys taper out into a maze of densely wooded low hills with only very few clearings, locally open forest that may be the result of fire.

7:32 Crossed large meandering river, apparently dammed and backed up into these hills making a very complex reservoir (or is it an estuary?).

7:34 Another arm of this, <sup>water</sup> very green.

7:35 Appr. Sydney

Oct. 9 - Sydney - Canberra flight (in Vaucluse - rt. side).

7:26 off ground. Mangrove swamps around some arms of Sydney Harbor - to left facing landward.

Just south of Sydney a sandstone (?) plateau with apparently a very low scrub or heath vegetation, somewhat dissected dendritically, the ravines wooded.

Southward along coast and back several miles the terrain becomes more wooded. The low sandy bluffs are apparently recently cut and not at all wooded. The slopes above them are not wooded but grassy.

Inland a wide cleared strip a fair sized healthy & grassy area surrounded by a mosaic of the same and low open forest.

7:34 A reservoir with a long branch at right angle, surrounded by a thin open forest with some grass & heath.

Rough cleared land in middle dislent.

7:37 Another reservoir.

7:39 A more reservoir, continuously wooded low, the dissected plateau

7:42 Some clearing, then mostly open country, with a small town - surrounded by cultivation, then by pasture with groves and patches of trees.

7:44 Considerable woods on dissected part of plateau. After that pasture country with occasional fairly sizeable wooded areas.

7:50 Some gully erosion in open areas.

7:51 Locally predominantly wooded hills, woods closed to locally open. Flat ground grassy. The grass generally in this whole region is bright green or thinly green, not brown as farther north.

7:52 A town to right. General area in pasture, little cultivation, some patches of forest on hills and areas of scattered trees.

7:53 Fairly headquarter very substantial, surrounded by trees and ~~back~~ hedge, but very widely scattered.

7:56 A small lake or large pond with what appears to be a floating bog mat in middle left. 7:57

7:57 Pasture with fair areas of forest and of scattered trees. A few areas with abundant fallen trees - these weathered. Some areas of grass with abundant shrubs.

7:59 <sup>1</sup> 8:01 <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup> <sup>9</sup> <sup>10</sup> <sup>11</sup> <sup>12</sup> <sup>13</sup> <sup>14</sup> <sup>15</sup> <sup>16</sup> <sup>17</sup> <sup>18</sup> <sup>19</sup> <sup>20</sup> <sup>21</sup> <sup>22</sup> <sup>23</sup> <sup>24</sup> <sup>25</sup> <sup>26</sup> <sup>27</sup> <sup>28</sup> <sup>29</sup> <sup>30</sup> <sup>31</sup> <sup>32</sup> <sup>33</sup> <sup>34</sup> <sup>35</sup> <sup>36</sup> <sup>37</sup> <sup>38</sup> <sup>39</sup> <sup>40</sup> <sup>41</sup> <sup>42</sup> <sup>43</sup> <sup>44</sup> <sup>45</sup> <sup>46</sup> <sup>47</sup> <sup>48</sup> <sup>49</sup> <sup>50</sup> <sup>51</sup> <sup>52</sup> <sup>53</sup> <sup>54</sup> <sup>55</sup> <sup>56</sup> <sup>57</sup> <sup>58</sup> <sup>59</sup> <sup>60</sup> <sup>61</sup> <sup>62</sup> <sup>63</sup> <sup>64</sup> <sup>65</sup> <sup>66</sup> <sup>67</sup> <sup>68</sup> <sup>69</sup> <sup>70</sup> <sup>71</sup> 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Oct. 9 - Vicinity of Canberr.  
(trip with Pynn & Robbins)

The general topography here is one of rolling low hills, surrounded by higher hills. The hills are covered by open to closed Eucalyptus forest, the depressions are, and apparently were originally, grassland. This is ascribed by Pynn to frost, the low places being referred to as "frost-pockets." Eucalyptus planted in these areas do not do very well, are coppiced and slow-growing, some not surviving long. This apparently accounts for some of the pattern observed from the air on the way here.

A small surviving sample of relatively undisturbed Eucalyptus forest (logging some time ago has removed all large trees) has an almost closed but thin canopy, trees spaced 2-2 m apart, at least 4-5 species, about 15-20 m. tall, 10-15 cm dbh, mostly smooth bark (gums) a few rough bark (ironbark), some of the species looking remarkably alike even though

not at all closely related. No intermediate tree layer. A well marked ericoid shrub layer, <sup>various</sup> about 1 m. tall, 3 m. apart, or more, a number of species in several families, with, on the more favorable slopes, large tufts of *Danthonia*, very common, these lacking in otherwise similar forest on more ~~as~~ unfavorably exposed slopes. No significant amount of herbaceous plants or dwarf shrubs. Bare ground with a certain amount of loose Eucalyptus litter between the plants. Erosion not conspicuous. Slopes are gentle here. This is said to be the dominant type of forest in this area. The ericoid layer behaves rather independently from the tree layer, on rocky areas with thin soil the tree layer may be very sparse or lacking.

Oct. 10 - flight Canberra-Hydney  
5:28 left Canberra

Rolling hills some densely wooded, some with scattered trees, some grassy, some obviously recently cleared, old trunks lying about.

5:33 Lake George (?), a natural lake, rather muddy.

Gullies running into it and toward it through pastures. Area shows signs of considerable accelerated erosion. All gullies look freshly incised.

5:35 Generally rolling pasture land, with patches of scattered trees and woods.

5:37 ~~cluster of small lakes or ponds.~~

Frosted area very extensive. In flat lying bed of sandstone desertsed, with many bare cliffs well

5:57 Coast south of Hydney lined with housing developments on flat areas backed by wooded hills. Flat areas crescent shaped, back of shallow embayments.

(Opposite last large reservoir noted on way to Canberra (7:35 11-187)

6:02 More sea cliffs along this coast, cut in sandstone plateau

interrupted by scattered narrow beaches. No beaches at foot of cliffs - vertical drop off into sea. Very complicates peninsula south of Hydney with much open sand, open forest, and mangrove swamp. Forms south side of Hydney Harbor

Oct. 11 Kilanea Iki - Trees below Byron ledge killed by heat from 1960 eruption - fires swept up sides of steep pit above lava lake. Some recovery, sprouting of branches from trunks.

Area of spatter around cone has trees all burned off at base and fallen toward S.W. leaving tree ~~mounds~~ in the semi-burned spatter. In these *Asplenium nidus* sporelings are

Oct. 15 - air trip Honolulu-Hilo  
 Molokai - still some bare red areas on west end, but perhaps less than formerly.  
 W. Maui - little or no woody vegetation on gulch walls on lee side. Dry vegetation very extensive.

E. Maui - on shoulder several patches of forest left - but perhaps regeneration. Gravel left. On flows at least one gun bripuka. Vegetation mostly very gray - check what this is. Landi wind striation on the n.e. side - alignment a bit peculiar - try to get air photos and study.

Kahoolawe - large areas of absolutely bare red soil. Some brieve, especially on slopes.

Oct. 15 - Kīi flow

Area examined with Wentworth in 1950. In undisturbed lava *Nephrolepis* is now very prominent, mature plants, *Pteris cretica*, mature plants occasional, sporadic of *Polyodium lineare* Thunb.

On disturbed part *Emilia javanica*, *Pteris cretica*, *Euphorbia* <sup>(in)</sup>, *Pluchea odorata*. Fine scoria

from 1960 eruption deposited over the whole area filling in interstices, providing a 'soil'.

In badly disturbed area many other species have come in.

Kapoho - (photos of cinder cone and in f.g. Kapoho <sup>front</sup> ~~front~~ side of "green cone")  
*Cyperus compressus*  
*Coccinia leschenaultiana*  
*Pluchea odorata*  
*Euphorbia hirta*  
*E. glomerifera*  
*Emilia javanica*  
*Digitaria chinensis*  
*Melinis minutiflora*  
*Setaria glauca*  
*Paspalum orbiculatum*  
*Tricholaena rosea*  
*Casuarina equisetifolia*  
*Solanum nigrum*  
*Vernonia cinerea*  
*Desmodium triplinerve*  
*Stachytarpheta jamaicensis*  
*Cuphea carthagenensis*  
*Crotalaria mucronata*  
*Connellina diffusa*  
*Indigofera tinctoria*  
*Passiflora foetida*

1955 flow below Kapoho bare flat boulder cinder a few scattered *Nephrolepis* a

few cm. tall, abundant under overhanging rocks. On more solid boulders algae are growing at fair depths in holes, moss (*Calyptrites*?) in sheltered cavities above the algae, and lichens in only slightly or not sheltered places. General aspect is no vegetation at all. Much new pine scoria.

Green cone has on north (?) side a low forest of *Aleurites*, *Artocarpus*, *Mangifera*, etc. on other side scattered bushes with ground layer of *Nephrolepis*.

In Kapoho, on top of old drum, almost 4 cm. of pine scoria.

Cone at head of Kumu flow  
Ropy pahoehoe - covered by lichen - *Stereocaulon*

*Nephrolepis* abundant ~~but~~ mostly 5-15 cm. tall, some fruiting.

3 years ago the lichen was as at Kapoho, now mature, 1 cm. or so. fruiting from about a year ago.

First year granite a few seed plants, mostly *Erechtites*, *apenn*

flowered and disappeared. Now only a few seedlings of orchid (*Anandina*)

Ferns are generally in crevices and folds in lava.

Mosses - *Camptolepis* sp. now fruiting. Lichen and ferns also reproducing, and algal also (*Scytonema hoffmannii*).

*Pteris* & *Hadleria* very rare.

Tiny kipuka of 1955 ash choked with *Nephrolepis* 2 m tall. *Pluchea*, *odorata*, *Eupatorium* *uppanum* *Colens* *stellarioides*, *Commelinia diffusa*.

Nearby are *Pityrogramma*, seedlings of *Metrosideros*, *Andropogon*, *Cyperus compressus* etc.

(b+w. photos of the kipuka and of the flow lava and the cone from which it came.)

Many other plants in disturbed material in road.

Oct. 16 Kilanea Iki - trees below Byron ledge killed by heat from 1960 eruption - fires swept up sides of steep pit above lava lake. Some recovery seen in form of sprouting from trunks of *Metrosideros*.

Area of spatter around new cinder cone has trees all burned off at base and fallen toward s.w. leaving tree molds in the semi-fused spatter.

In these are numerous *Nephrolepis* seedlings. A very few small seedlings

Oct. 16 - Kilanea Ihi,  
Kilanea Volcano  
on fresh spatter beds

41345 *Oxalis martiana*  
local  
3 66 *Oxalis corniculata*  
rare

Oct. 15 - ~~near~~ Head of Kii <sup>1955</sup> flow,  
Puna District

3 67 *Nephrolepis multiflora* (Roxb.) Jarrett det. 1976  
abundant in ~~very~~ tiny  
~~topsoil~~ pit in flow, bottom  
covered by very fine scoria  
2 68 *Nephrolepis multiflora* (Roxb.) Jarrett det. 1976  
~~at~~ common ~~as~~ in cracks  
and folds of flow, full sun.  
1 69 *Metrosideros collina* var.  
on bare lava, in cracks  
2 70 *Metrosideros collina* var.  
dominant in forest on  
old lava.  
1 71 *Sacciolepis indica* <sup>contracta</sup>  
on cinder road on lava flow  
1 72 *Setaria geniculata*  
on cinder road on lava flow.

BB

Oct. 15 - Kapoho, Puna Dist.

1 73 *Casuarina equisetifolia* L.  
common on fresh ash and fine lapilli

flowers pink.

many spreading stems  
from center, flowers yellow,  
capsules pointing upward  
green, dehiscing elastically

*grondi* erect, wool. on  
rachis varying from  
white to tawny.

*grondi* erect.

seedlings, presumably  
of 41370

slender erect tree 3-10 m. tall,  
stamens light red.

seedling, mycorrhizae on roots.

19

200

1960 Hawaiian Is.

(ctd. from p. 197.) in crevices and on lee sides of still standing tree trunks. Near edges of spatter *Cyperus brevifolius* coming in, especially around bases of standing tree trunks. Apparently a "shelter effect" ~~causes~~ just enough amelioration of conditions to permit establishment. *Oxalis* spp. also established.

In area covered by pumice lapillae to any depth no plants at all except a very few *Nephrolepis* in tree molds. However, here most tree molds filled by coarse scoria or pumice.

Large area of *Metrosideros* ~~are~~ completely killed but mostly still standing.

Farther from ~~the~~ cone the *Metrosideros* which appeared dead are vigorously sprouting from bases and trunks.

Wentworth has photos of maps by Richter showing the depths of pumice accumulation. One of park rangers,

and Juliette Wentworth have fixed points at which they have taken photos and can take more in future. Blackberries which have

413

1

3

3

2

1

2

1

1

1

come up abundantly in area of thinner pumice have been killed by spraying by N.P.S. people.

*Dubautia* (yellow fl'd.) and *Vaccinium* spp. in areas of very thin pumice seem to have been greatly stimulated. The berries of *Vaccinium* are unusually large. The *Dubautia* is dark green with an abundance of yellow flowers.

A single *Erechtites valerianifolia* seen growing from the side of a tree mold.

